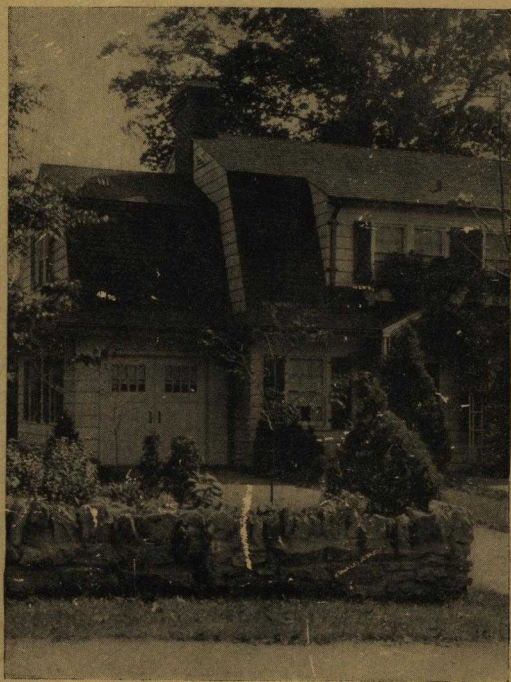


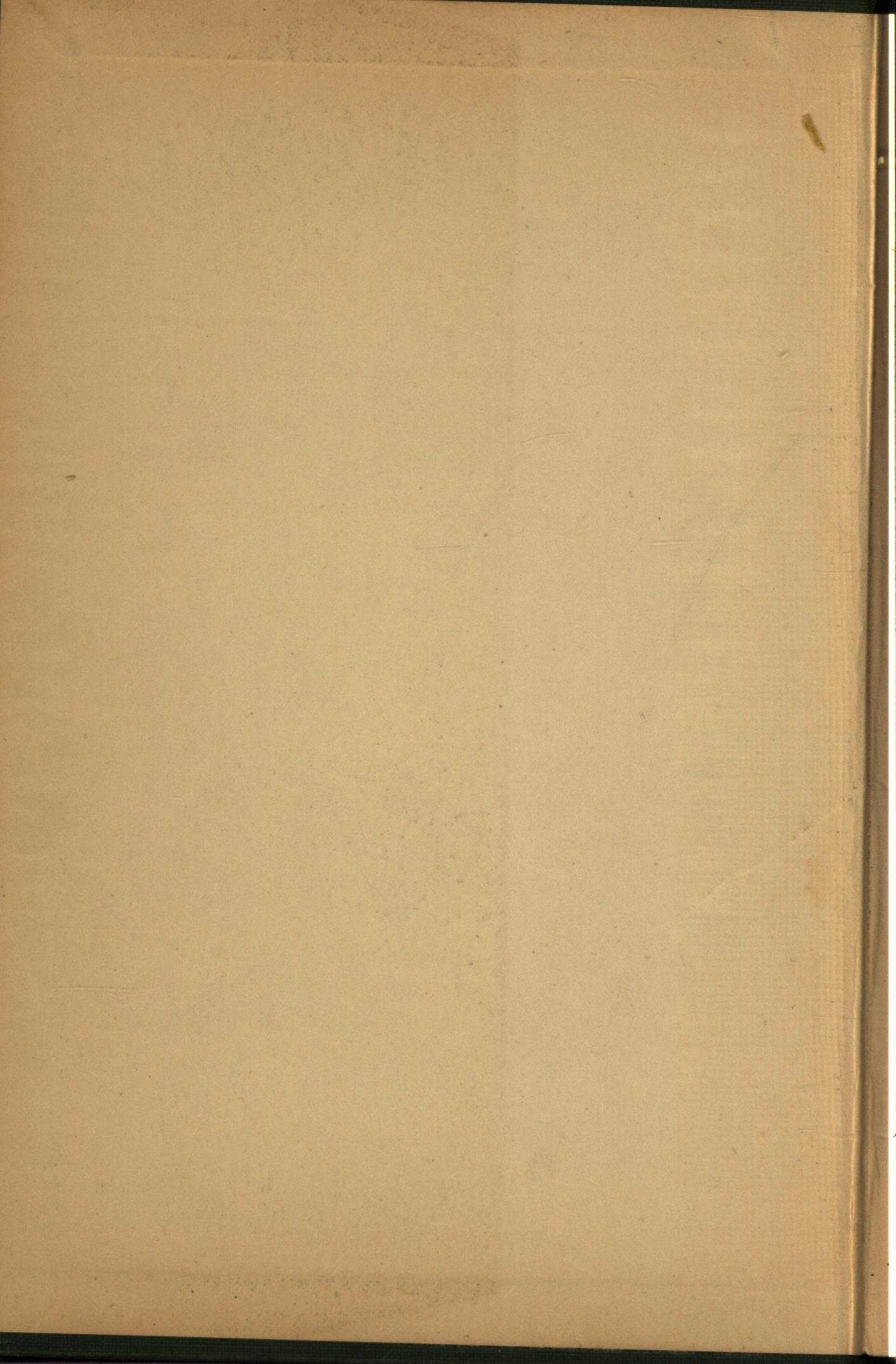
THE AMERICAN HOME BOOK OF GARAGES

ILLUSTRATED WITH NUMEROUS DIAGRAMMS



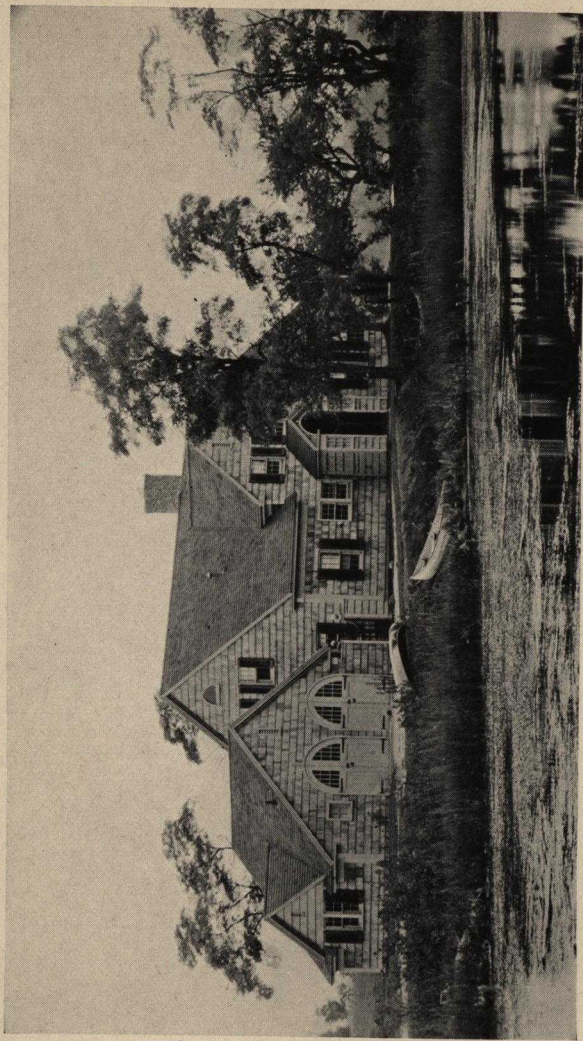
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BOOK OF GARAGES



TWO-CAR SEMI-ATTACHED GARAGE

The garage roof lines, as here treated, harmonize beautifully with those of the main dwelling. *John C. Dodd, Architect.*

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THE AMERICAN HOME BOOK OF GARAGES

BY
DOROTHY AND JULIAN OLNEY

Illustrated with Numerous Diagrams



Edited by
REGINALD T. TOWNSEND
Editor of THE AMERICAN HOME

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FIRST EDITION

FOREWORD

THE HOUSING FACILITIES of the private automobile should not be one of the least, but rather one of the most, important considerations in realizing a balanced relationship among the features of our home environment.

For long generations the kitchen was regarded largely as a workroom in which utility was served to some extent, but convenience and beauty were scarcely given any notice. Now we have beauty in our kitchens and every possible device for labor-saving and convenience. So, too, the garage after long neglect has come to be regarded as a fixture in the home scheme. Therefore, it must provide something more than a shell to keep out rain and snow.

We have endeavored to present in the pages following the essential data and information, plus the "something more" which the home-owner should have available in building

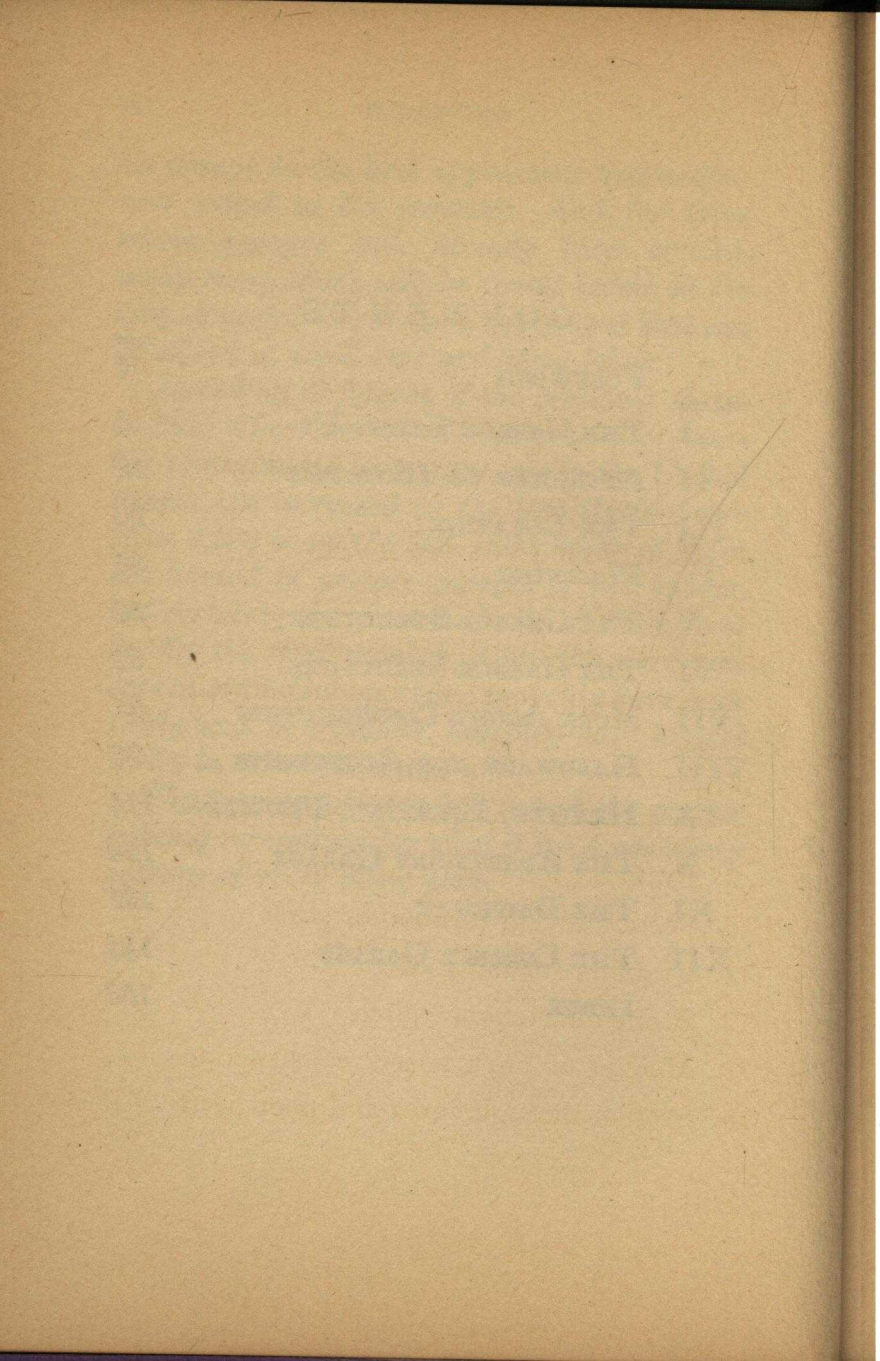
his garage to the best appearance and usefulness suited to his purposes. And for those whose garages have already been erected, many suggestions will be found herein in the way of improvements and equipment that can be added at small cost and some labor.

According to figures of the National Automobile Chamber of Commerce, the number of registered passenger cars in the United States has increased in the last thirty years from 3,200 to 23,121,589. How many of these are housed in private garages is not known, but certainly the great majority of them must be. Of the total number, 3,800,000 were new cars in 1929. Garages have probably kept pace fairly well in numbers, but they have lagged badly in other particulars.

The turning point is here! And the garage is being recognized for what it is—a necessary feature of every home plan.

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**THE AMERICAN HOME
BOOK OF GARAGES**

THE AMERICAN BOOK
OF THE BIBLE

I

THE GARAGE GROWS UP

AFTER occupying a place in the old family stable or perhaps in a crudely planned out-building, the automobile has finally been adjudged worthy of a home. It has required about a generation of time for the housing of our cars to attain its present stage where not only is necessity served, but convenience and appearance also come in for their proper share of consideration.

The day when a hastily constructed box just large enough to hold a single car, having practically no conveniences and sometimes not even a floor, was set up on the rear end of a lot and called a garage is passing. The private garage was for a long period a neglected child—tolerated chiefly because the sheer necessity of the moment demanded it. It apparently did not pretend to keep pace with the development of the auto itself in either utility or appearance.

The garage is one of the last important features of the home to be brought down to date, and it is now not only performing its necessary mission better than ever before but it is also doing so artistically. The time was when the back line of the small home plot, in most cases, was expected to, and did, present an untidy appearance. The advent of the automobile with the necessity for its proper housing introduced the garage, which helped appearances some. But everything does not happen at once, and now we are at the point where the garage provides not merely housing facilities—it is actually becoming a home for the car.

The owners of the first automobiles were generally those of wealth sufficient to maintain a private stable. The first cars, therefore, often found lodging in a corner of the stable side by side with the carriages they were to supplant almost entirely a few years later. The storage place for hay and grain at the same time gave way to the requirement of only room enough in which to keep the gasoline tank.

Speaking of the gasoline tank, it is interest-

ing to note here that most of the early accommodations for autos were provided with gasoline tanks, for filling stations in those days were few and far between. This and the fact that automobiles in their early stages of development frequently caught fire were good and sufficient reasons for housing the car just as far away from the house as convenience would permit. These dangers are now practically non-existent, but it is easy to see how from these beginnings there developed the isolated little garage set away from the house at the rear, the requirements of which were simple.

Requirements now are far more numerous and have assumed the form of specially arranged facilities in the house itself. This latter type of garage has been receiving very wide acceptance and will be discussed in detail in the succeeding chapter. There are many points in its favor.

It has been found that, while serving as an adequate home for the car, the garage to-day can be brought to a high degree of usefulness. Just a little foresight at the stage when it exists only on paper can result in the intro-

duction of many conveniences that actually add little to the cost but much to our comfort. Somehow, little items are either easily overlooked or are merely neglected. After the garage has assumed physical form, however, innovations and improvements become costly. Thought should be given to planning the garage in the first instance that it may serve its greatest usefulness at the same time it is made to please the eye.

Architecturally, the garage is coming in for a greater share of attention than it ever had previously. This has been largely made necessary by the tendency to move garages closer to the house and even include them in the house itself. But, whether set over in a corner by itself or included as an integral part of the house, the style and construction of the garage should, of course, be of a character to go with the house. Where the dwelling is brick, the garage should be of like material and of a design to correspond. That it should be attractive, and perhaps even present an artistic appearance, at the same time it serves a useful purpose is quite within the range of possibility, though there would seem to be many own-

ers of homes to whom this possibility has been exceedingly slow in making itself apparent. Our garages are deserving of just as careful thought as the landscaping or any other feature that contributes to the appearance and unity of design of our homes.

Certain clients of architects, even in the earliest days of the motor car, required architectural treatment of the garage problem. It is humorous now to note that a writer in the *American Architect* at that time remarked: "So though the architect may still affect the homely and reliable bicycle as his own personal mode of locomotion, he enthusiastically approves the change in habits of clients which makes necessary the designing and providing of a new type of building."

It is quite likely that architects generally were somewhat slow to recognize artistic possibilities in a mere house for the automobile. If so, this may account in large measure for home owners themselves being slow to see the possibilities therein. In any event, when the householder came to the point of allotting a part of his own dwelling to the car, then the architect had to recognize in earnest the archi-

tectural problem that accompanied the advent of the automobile. This provided at once an opportunity as well as a problem.

The garage of to-day must be as nearly modern in every particular as we can make it—easy to keep clean, provided with ample light, and possessed of every possible convenience. For the smart, highly developed automobile of to-day is the very embodiment of modernity and deserving of facilities as far removed from horse and carriage days as is the car itself.

Now that roadways and other facilities for the motorist, and even towns themselves, are laid out in full recognition of the requirements of the automobiles, surely our garages must keep pace. And it can be truthfully said that from an artistic liability they are beginning to become a distinct asset architecturally and to demonstrate their place as an essential feature of the home scheme.

Many home owners of moderate means are now insisting on two-car garages. There are many obvious advantages and the cost is but little more. A garage of the minimum size to contain one car is out-of-date; though in small

home development projects this is frequently what one gets. There are so many possible uses for extra space that it is not wise for the sake of a few dollars to be cramped. Also, while there are numerous good drivers, there are still some who appreciate fully the latitude of a few extra feet on either side in getting in and out of their garages.

Many car drivers to-day are also mechanics and do much of their own repairing and overhauling. To such the garage becomes a work-room, and the more completely equipped and well-arranged it is, the more satisfactory it is to work therein. Certainly there is little efficiency and still less inspiration in working amid disorderly and crowded surroundings where no thought has been given to proper accommodations.

The condition and arrangement of a garage should be just as expressive of the owner's personality as is his house itself. Grease and waste materials strewn about not only look bad but increase the fire hazard. The interior of the garage, except when included as a part of the house, is seldom finished up and hence presents a somewhat barn-like appearance.

This does not, however, preclude its being kept in clean and orderly condition.

As for the actual cost of the garage, this may be almost any amount, depending chiefly on the locality, materials, and the builder. Labor being the principal item of cost, many a house owner has built his own garage at odd times, or during a vacation. It is not a very difficult task, but one that will be full of interest to the amateur. The framing will probably present the most problems, but even this is relatively simple. To one person, building one's own garage may represent a disagreeable task, while to another it would be replete with thrills as he visualizes step by step the advance of his own handiwork. Economy is a motive that prompts the course of many a small home owner and sweetens the task in the knowledge that money saved is at the same time earned.

If your garage is already built, this should be no deterrent to going ahead and making your own changes and improvements should they be deemed desirable. Where space permits, it is a relatively easy matter to construct a work bench, install shelving or cupboards for the accommodation of tools and other para-

phernalia that go with the care of a car, make racks for garden tools and other equipment, etc. On the exterior much can be done for appearance through judicious planting and the careful arrangement of trellises. Ugly lines can thereby be softened and the garages made a real part of the home surroundings.

Whether you now have your own garage or plan to construct one, we here suggest that you apply a test consisting of the following points and see if your garage possesses these more important requirements:

1. Does it harmonize with its surroundings?
2. Has it the proper location and driveway arrangement?
3. Is it economical?
4. Is it the right size and conveniently arranged?
5. Is it well constructed? (Adequate fire and weather protection are principal considerations.)
6. Does it possess the proper equipment?
7. Does it adequately serve your own needs?

II

ATTACHED OR DETACHED?

To THE prospective home owner these days it seems to be somewhat of a problem whether he shall have the usual form of detached garage or one which is attached to the house. The trend now appears to be definitely toward the latter form. There are naturally many variations of each; and there is one intermediate type of garage, known as the semi-detached. This latter is actually a detached garage, but it is usually located closer to the house and is connected with it by a pergola, arcade, or specially constructed walk of some kind.

As pointed out in the chapter preceding, there were good reasons why at one time all garages were of the detached sort. Twenty years ago it probably never occurred to anyone they would ever be otherwise. But the automobile is now a vastly improved vehicle

and old prejudices and dangers have been removed. The chief dangers that still go with the housing of a car are those from gasoline, waste oil, and the exhaust fumes; the prevailing building codes, however, now include regulations which provide ample security against the fire hazard when the car is housed in the dwelling itself.

Other objections to the attached form of garage may be found in the lack of adaptability in the contour of the ground, making a good approach difficult; the arrangement of the inside of the house might not lend itself readily to the inclusion of a garage; and many object merely on general principles to having the noise and disorder that usually accompany the auto brought into the house. The necessity for fireproof construction must also not be overlooked.

As a matter of fact, the chief problem presented from the outset has been architectural. Many houses with built-in garages are so poorly designed that the garage feature is not subordinated sufficiently to harmonize properly with the character of the house as a whole. The built-in garage must in no wise detract

from the appearance of the house itself if it is to present a successful appearance. Architects and builders are at last taking advantage of their opportunity, now that so many home owners are turning to this type of garage; and the general result has been some very charming homes in which the garage feature only adds to the attractiveness of the exterior. Often it can be cleverly worked into an entire architectural scheme.

Even a casual study of the advantages that go with the attached form of garages makes the reasons for the present vogue in their favor readily apparent. The proper section of the house to devote to garage space is taken up in the succeeding chapter. In this type, the garage generally takes one of two forms: it is built in as an integral part of the house, or it becomes in substance a separate structure at the same time it is a part of the dwelling itself. This latter arrangement makes it quite possible to have an attached garage even though the house has been already built. In this case it will probably form an ell built onto the main structure.

Sometimes there is even an architectural

advantage in having a garage like the last mentioned in that a house with none too graceful lines can have its appearance greatly enhanced by having a garage built on in this form. It will help to soften harsh lines and at the same time tend to draw the roof lines down closer to the ground, tying in the house more agreeably with its surroundings.

Another incentive for having this form of garage is that, where the plot of land is small, it may result in a great saving of driveway space. The house set back thirty feet from the front line with a garage on one side only requires a thirty-foot driveway whereas, were the garage at the rear property line, much more space would be required for the driveway. Where the plot is small a driveway running the length of the land certainly does not add to the beauty when, if used for garden space, the layout could be far more appealing.

The contour of the lot may also be a consideration. Where the house is placed on a hillside, the garage may of necessity have to be placed in the side of the hill under the house. This usually means that the garage fronts directly on the street and little or no driveway

space is required. A side-hill conformation may also provide ideal ways of fitting the garage into the house, depending on how skillfully the architect or builder adapts his structure to the slope of the land.

One of the obvious advantages that is bound to be first among the considerations influencing one toward this type of garage is the convenience. To step from a room of one's house directly into a car waiting in an adjoining room, not only saves many steps going to and from the garage located somewhere outside, but also avoids the need for going out in inclement weather to reach the car.

While speaking of the weather, in localities where the temperature is in the habit of spending a part of each year at or below the zero point, the detached garage is seldom blessed during freezing periods. Starting the car under such circumstances is not only a strain on the starting gear and wears down the battery; it also works a considerable strain on the disposition.

There are devices for heating the separate garage, as detailed in Chapter IX, but how

simple this problem becomes when the garage is located right in the house! It merely means extending the heating pipes into the garage space and adding another radiator. The blizzard may then rage outside while the car will need no extra coaxing to warm up to the occasion.

The lighting of the attached garage is also a simplified matter. Most small detached garages possess no lighting conveniences of any kind. After putting the car away late some dark night, the owner then proceeds to stumble around over stray tools or slips in a grease spot, after which he generally reaches the door; then he has to steer his way in the dark to the house. Where a garage is part of the house it is easy to have it wired the same as any room with outlets arranged at convenient points.

This also applies to plumbing arrangements. Seldom does a small detached garage boast of running water. Yet a handy wash basin and lavatory are very desirable. It is certainly easier to wash one's car under these circumstances on a winter's day than outside

where the water congeals almost as fast as it is applied.

To summarize here the main points of advantage in the attached type of garage, we may say these consist of the following:

1. There is greater convenience.
2. Driveway space may be economized.
3. It is easier to heat.
4. It can be lighted economically.
5. Plumbing arrangements are more feasible.
6. There may be architectural advantages, depending on the design of the house and the conformity of the plot.
7. Economy may be a favorable factor.

With reference to this last item, it may or may not be the part of economy to have the garage located in the house. Speaking generally, the cost would probably be less; but the necessity for fireproof construction and the fact that the interior of the garage in this case is usually finished throughout with plaster work make added items of expense. Then it must also be remembered that the attached garage is sure to possess conveniences not

common to other garages in the way of heating, lighting, and plumbing equipment. These could easily add \$100 or more to the expense of garage accommodations when included in the house.

Of course, where so much separate wall and roof construction is sometimes avoided, there is bound to be a substantial saving. And were the attempt made to heat and light the detached garage, naturally the expense for these conveniences would be much greater in this case just because the garage is a separate unit. So it merely becomes a plain question of exactly what the individual wants his garage facilities to include. The more complete he insists on having them, certainly the greater is his saving where the car is housed in a section of the house devoted to this purpose.

Where the first five points given on page 16 are advantages to the garage that is attached, it follows they must be disadvantages where it is detached. As for the matter of architectural unity, the type or style of your house or the lay of your ground may make this more readily achieved with the garage as an entirely separate unit. In this case, of course,

it must reflect in design the same character as the house. And it does not necessarily have to be constructed with a view to eliminating the fire hazards.

One of the main advantages of having a separate garage structure is that it keeps away from the house the noise, fumes, and the disorder accompanying automobile quarters. The fumes are a menace and are many times easily overlooked; and the chance of explosion or fire from a car endangering the house is surely eliminated. And there is also avoided any complication in the planning of the interior of the house.

Where a toolhouse or workshop is wanted in conjunction with a garage, it is usually best to have all of this away from the house. The various tools and equipment used in garden work may occupy quite a space, and special facilities for taking care of them are best provided in a separate structure.

The interest in the attached form of garage is bringing about a trend that is even now causing a redesigning of our homes to favor the automobile. The house in which a garage is included becomes at once more complete in

its facilities and may present a more attractive appearance. It usually makes the small house look larger and more extensive, and certainly it is better adapted to the plot where the ground space is limited.

III

THE LOCATION

AFTER the basic question of whether or not the garage shall be attached to the house has been determined, there are still many possible locations for it. Its placement must always be considered in relation to the house, no matter what the size of the lot may be. The ingenuity of the owner and architect may be taxed to the utmost by the irregularity of a plot, so that the result will be dependent upon the building's adaptability to that particular property. There may be a fond desire on the part of the owner that his garage must assume a certain definite form. However, if his property is ill-suited to that type, he will never be satisfied with the effect. The size of the plot has a great deal to do with the possibilities at the outset.

If the lot is a narrow one, it is certainly inadvisable to plan so that the strip the entire length of the property has to be used for a

driveway. If it has not seemed desirable in other ways to incorporate the garage in the house, it is quite possible to have a common drive with a neighbor as shown in Figure 1 (E, F). This works well when the garages themselves are separate and are located appropriately. The matters of cost and upkeep of the driveway will present no serious problem where neighbors are united on the end to be attained. A study of the figure mentioned will reveal the great saving in space from adopting such a plan.

The amount of driveway space used is only a considerable problem on the small narrow lot, as it naturally would not be so out of proportion on a large piece of property. However, given the small garage on the back of a narrow plot, there are several things which can be done to help the situation. In this case, the lawn is at a premium and instead of a solid cement drive, cement strips with lawn between can be used to great advantage. Then, since the building must usually be three feet or more from the property line, this gives about five feet from the drive to the boundary. If this space is carefully planned, it can be

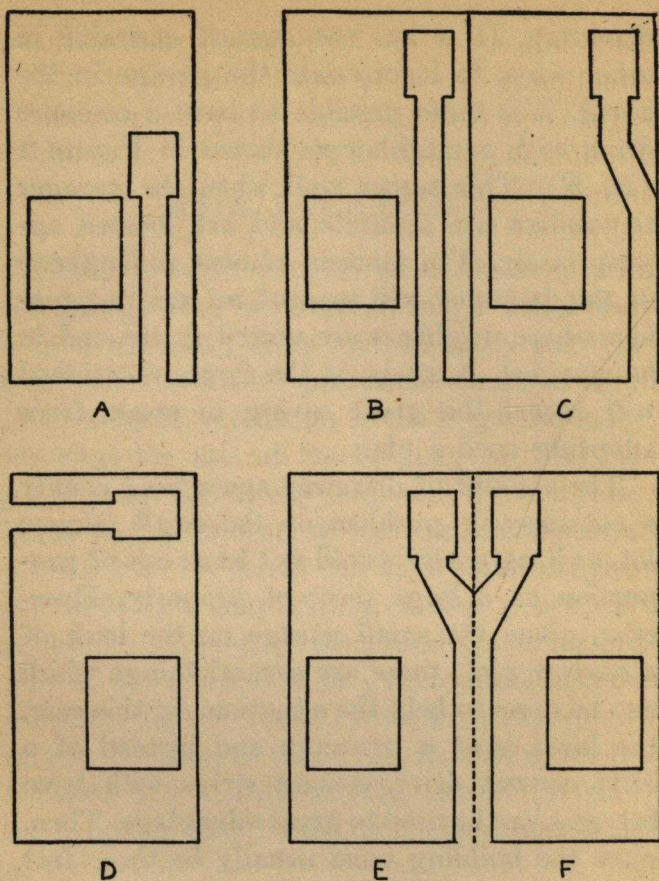


FIGURE 1. Arrangements for detached garage and driveway.

made into an attractive flower border so that attention is diverted from the driveway.

In some localities, an alley is provided through the middle of each block, thus eliminating the necessity for driveways through individual properties. The garage entrance then opens off the alley. In this case the front line of the structure should be set a few feet back from the lot line as it will save much difficulty in driving in and out.

The saving of the long driveway space can also be managed by moving the garage up from the back line almost to the house so that the back yard space can be more advantageously utilized for garden and play-yard space. This makes a safe place for youngsters and, in a neighborhood where it is consistently done, a very pleasing view can be had from the back windows instead of the usual view of a row of "cheese boxes."

Even if the property is of a very good size, the garage can scarcely be put so far away from the house that it need not be considered in relation to it. No one wishes a long walk to his own garage, so here we still have a driveway taking up valuable space near the

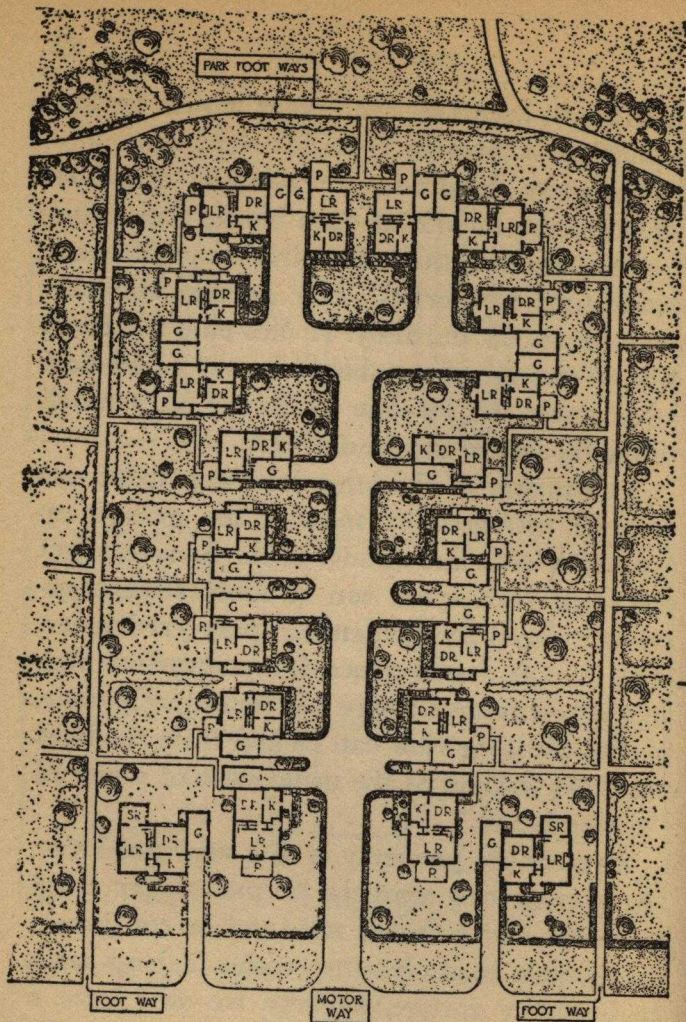


FIGURE 2. Section of City Plan of Radburn, New Jersey—a town designed for the motor age—showing layout of motor and foot approaches to houses. (*City Housing Corporation.*)

house. In this case, sometimes it is possible to have a winding drive that will be much more pleasing to the eye than a straight strip.

These considerations have all been of inside properties. Fortunate is he who has a corner plot, for he can have his front entrance on one street, and his driveway and garage on the other. In this way, they can be planned entirely separately. It is wise with the separate garage in this case to place it so that the driveway will run the length of the narrowest part of the property, so that as much driveway space as possible will be eliminated.

The hillside or sloping piece of land sometimes lends itself beautifully to the garage, for it can often be tucked away so that it is right on the street and no driveway at all is necessary. Hillsides also have their problems and may render an accessible driveway approach almost out of the question.

With the garage in the house, the driveway space is minimized and the garden can be enlarged. Since we have thought for so long of the garage in terms of utility only, we often left the back of the property un-beautified along with it. Now with the space

free from building, more possibilities become apparent in landscaping.

The location of the attached garage is complicated in that it has an important effect on the floor plan of the house itself and often causes vital changes in the arrangement of rooms. We have, from the very fact that our house has four walls, four sides in which, by some means, we might put the car entrance: the back, either side, or the front. The contour of the land has much to do with this selection, for the ease of getting in and out with the car is, after all, one of the prime considerations. The position of the garage at the back of the house seems the easiest to many people, for they feel it does not so much matter if it does somewhat spoil the lines there. In our opinion, however, the lines of the house are as important on one side as on any other. When the plot slopes toward the back, then is the ideal time to put the garage in the basement at the rear. It must be handled carefully to avoid an awkward effect of too much wall space, however.

Another way of having the garage entered from the back is when it takes the form of a

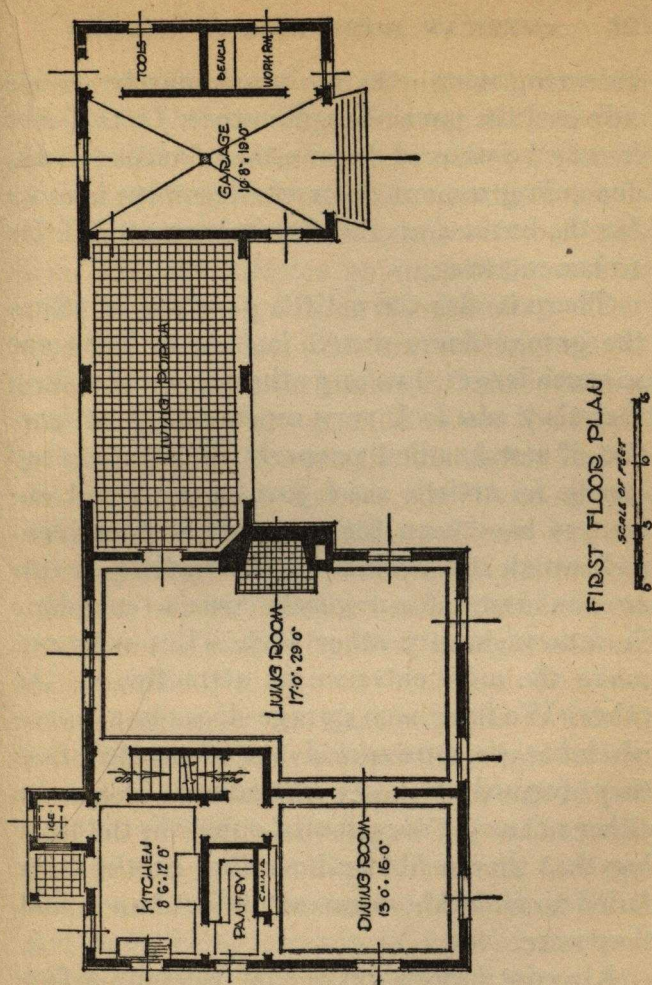


FIGURE 3. Plan of a semi-attached garage connected with the house by a porch. (R. C. Hunter, architect.)

balancing wing—the sun porch may be on one side and the garage on the other. In this case it may be entered from either front or back, depending somewhat on whether there is room for the extra amount of driveway needed for a rear entrance.

There is also the artistic question of where the garage doors would look best. They are so much larger than any others in the dwelling that they can look very much out of proportion if not handled properly. However, they can be an artistic asset just as our front entrances have been for years. It is a problem well worth study when we realize that, in this age, as many of our guests come to our door in cars as in any other way. Then why not make the auto entrance as attractive as the other? We have seen garage doors in a Spanish home so constructed and decorated that they formed its chief attraction. We have either not as yet accustomed ourselves to thinking that they could be beautiful, or else have failed to make the necessary effort to see that they were.

A recent innovation is that whereby a formal front entrance and the auto entrance have

been combined and form a single main entrance to the dwelling. This has already been successfully accomplished in a few instances.

One quite frequently sees garages placed in the basement even when the land is quite flat. This necessitates an excavation and results in quite a pitch to the driveway. There may be situations that necessitate such arrangements, but nearly always there is another and far better way out. And surely the ease of getting in and out with the car should be considered in a snow-and-ice climate. A garage beautiful, but inaccessible, would not be functioning in any kind of an efficient manner. In climates where there is severe cold, let us plan for all conditions even though we build in summer.

Arranging for the garage in the basement, incidentally, is an excellent way in which to use space that frequently serves no good purpose at all. The only requisite is an entrance for the car, with a fireproof ceiling and partition added on the inside. The three walls and floor, being already of masonry, require no change. This method is economical and provides warm quarters in winter. The main diffi-

culty with the basement garage, where the dwelling is not on a hillside, is in locating a good driveway approach. A ramp approach at the rear is probably the least conspicuous.

It seems well, however, to plan for the garage in the basement only when the land naturally adapts itself to this method. Where it is absolutely flat, the effect will be more harmonious and the garage more easily accessible when planned on a level with the first floor. It may be part of the house proper with a maid's room or bedroom over it, or it may be added as a wing and the upper part made into a sun porch.

A new vogue that has been creeping into the design of small houses is the tendency toward placing the rooms on different levels. In other words, the kitchen, living, and dining rooms may constitute one level, then one goes up a few steps to a bedroom on a second level, beneath which is placed a garage that will only be set a few feet below the surface of the ground. Then above the rooms on the first level other bedrooms may be arranged.

With the garage on the first floor, we again have the question of whether to enter from

the front, side, or back, and the same considerations apply. The entrance depends, for the most part, on the size of the property and the style and lines of your house. So many houses in the past have been built in rectangular fashion that the attached garage gives us a chance for pleasant relief in this regard. A roof line pulled down to accommodate the car makes the house seem to hug the ground more and possibly gives artistic results.

In the Southwest where the climate allows more choice in building matters there always have been architectural experiments. In one case, a physician has his garage in his attic (he lives on a hillside) because he can get in his car to answer a call at any hour of the night, coast down his drive, and not be under the necessity of starting the engine until some distance away from his sleeping family.

Another type of garage, referred to as the semi-detached type, gives still further choice of location for the garage. We know that our ancestors often connected their stables indirectly with the house by a series of outbuildings, and thus secured a charming rambling effect. We can easily tie up our garage build-

ing by having a low fence as the connecting link between it and the house. A pergola, arbor, or lattice work may all be used to good effect. There are several advantages to this method. It may afford the basis for an enclosed garden space that can be made very charming with appropriately placed borders. Or it also makes possible a good play-yard enclosure. Hedgerows and garden gates, when nicely arranged, are very effective. In this way, the garage is drawn closer to the house and makes for less inconvenience in bad weather.

The location of your garage, of course, can be in almost any part of your house or grounds. But there are only certain spots where it rightly belongs. If for some reason (or no reason) it happens to have been placed already where it does not seem to belong, you can help it effectually through proper planting. It does not seem necessary to have the foundation of a garage exposed to the world any more than that of a house. Flowering shrubs are always effective, and a few evergreens in choice locations can accomplish a great deal.

The quickest and most inexpensive effects

can always be secured from a few well-chosen annual seeds. A row of dark red hollyhock blooms against a white garage background always catches the eye. Golden Glow fills up space rapidly and takes away the bareness of a side wall. A colorful display can be made to form an effective screen for an otherwise inartistic background.

If there is on your hands a box-like garage which must be used, ingenuity in the placing of trellises can transform its whole appearance. A ladder trellis on either side of the doorway seems to change even the lines themselves, and the blossoms add cheer as one enters. An arbor, covered with wistaria or some other flowering vine, may be put in along one side and not only extend the lines but prove to be a cozy retreat. Vines are easy to cultivate and can work wonders where given a chance in the right place.

With the garage that is incorporated in the house, the question of planting is, of course, considered along with the rest of the house. A well-known landscape architect has stated: "Landscape design is to a large extent a study in relation. All home properties, except where

absolutely flat and treeless, will have topographical features, that to some extent will determine the location of the house and the surrounding landscape scheme."

This relation of house and garage to land must be planned in the beginning, and then we will find that utility and beauty will be combined in their proper relationship.

In choosing the location for any garage, be it in or out of the house, the matter of drainage is another important consideration. The building should be planned so that the water drains away from it and not into it. This is one great difficulty with having a garage in the basement, unless it is hillside property. The incline for the driveway makes a drain right into the garage. Even on flat ground, the nature of the soil must be determined so that the drainage condition is known and the garage elevated to the proper extent above the surrounding ground surface. It is an expensive proposition to do this after the garage is built, but it has been necessary in instances where forethought was not exercised in the first place.

Remember that the location of your garage may easily determine its efficiency and will either enhance or detract from the unity of design that should characterize your home grounds.

IV PLANNING

As we look at many of the garages in use to-day we realize that planning has not entered into their development to any great extent. Most of them, like Topsy, have just "grewed." They afford weather protection to a degree and but little else. Again, we emphasize the tying in of the garage with the house through conformity to the style in which the house is at present, or is to be built.

By unusual or particularly good use of the space at hand we can make of our garage another room with numerous uses, whether it be in the house or away from it. In this day when costs are higher and houses smaller than heretofore, we should continually be devising uses for the space we have available, and this can be best done by wise planning in the beginning. It is not only the cost that makes planning really of value, but the forethought that is necessary. We cannot say of

a garage any more than of a house that it should be thus and so, for its successful use will depend on how well it fulfills the demands of its owner.

Whether we buy or build, we choose an architectural style which we admire and, to have the result harmonious, all elements of the plan must conform. If we have a Colonial house, let us by all means have a Colonial garage. The garage may harmonize with any style or period by adopting the general characteristics of that period—by treating the roof, doors, and windows in the right way, by using the same materials of which the house is made, and by repeating some particular motif of the house on the garage.

There are several kinds of roofs, the more common of which are the shed roof, gable roof, gambrel roof, and hip roof. It would be a great mistake to put a hip roof on the garage supposed to harmonize with the gable-roofed house. And the same applies to other details and the materials of construction. The Georgian house of brick demands a brick garage, the English half-timber-and-stucco construction must be repeated in the garage, and

so with the stucco of the Spanish or Italian types.

Thus we can clothe the house for our car in any architectural design which we may

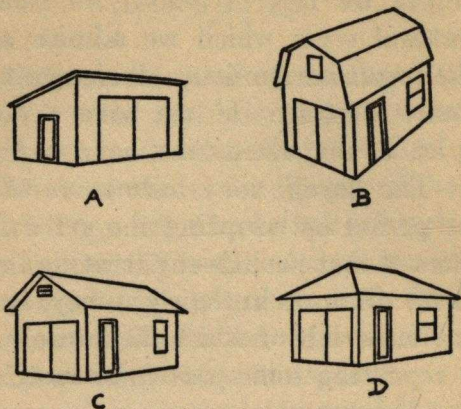


FIGURE 4. Chief types of garage roofs:
(A) Shed Roof; (B) Gambrel Roof; (C) Gable Roof;
(D) Hip Roof.

choose, if it be in entire keeping with the rest of our home. This is the first step in planning. Secondly, of course, before we can even have it worked out on paper, it must be decided whether we are to have a one- or two-car garage. To-day there are many more reasons for building a two-car garage than formerly,

even if there is only one car to be housed at the moment. When the building houses two cars, the cost per car is considerably less than with the one-car structure, whereas if after the building is completed the need arises for room for another car or other purposes, the additional expense is considerably more.

The extra space can be used for several purposes. It may house a second car for the young members of the family or for business purposes; it may provide a good rainy-day playroom for the children; it would make a splendid workroom for the handy man in the family; it provides hospitable storage for the car of a guest; it houses garden tools and accessories comfortably; it might be made into an attractive studio; or it may be rented so that the income may cover the taxes, interest, and other charges on the entire building.

After it has been decided whether to have a one- or two-car structure, the actual dimensions must be considered. The amount of space available is frequently a source of limitation, but in most cases there is room for a few feet of leeway. Strange it seems that so many garages are built too small for comfort when

the addition of a foot or two in the beginning would have meant so little extra cost. We cannot say that the exact size of your garage should be 10' x 16' or 20' x 20', for it depends on your own problem. However, 10' x 16' is the smallest size that can be used to house a Ford or any other small car.

The height and width of most cars do not vary greatly, but the length differs considerably. The height to the rafters should be not less than 8' and the pitch of the roof can be anything one wishes, though it should resemble somewhat that of the house. The largest passenger cars are about 18' long; add to this allowance for the front and rear bumpers and space enough to walk around it and you will find that 20' to 24' is the length required by a large car for comfort. For a single-car garage, 12' x 20' should allow ample room—enough to accommodate almost any car and leave enough room for a closet and work bench; 20' x 22' should be sufficient for a two-car garage, the latter figure representing the length.

The only other basic dimension necessary is that the door opening for a single-car garage

must not be less than 8' wide. After providing for basic requirements, the dimensions may then become the choice of the owner.

In providing for the different uses to which a given garage is to be put, everything must be considered from the cost to the lay of the land. It is far easier to realize the merits of different plans by seeing them than by just talking about them. Hence, a study of the floor plans presented herewith should be helpful. All of these layouts have actually been worked out in practice and their feasibility demonstrated.

The floor plan of the garage may be varied in many ways regardless of whether it is attached or detached. It forms a unit in itself and can be subdivided, partitioned, or furnished in any way the owner sees fit.

The garage to which proper thought in planning has been given has adequate facilities for ventilation. This is chiefly important as a measure of safety to prevent the accumulation of poisonous gases. When the engine of the car is kept running in the garage, doors and windows should be open, or a device installed to carry off the gas from the exhaust

pipe as described in Chapter VIII. This matter of ventilation and gases is perhaps harder to handle in the attached garage where frequently the only opening is the doorway and this sometimes becomes inadvertently closed.

There should be at least two windows planned to secure plenty of ventilation. If possible, there should be one on each side and one at the back. To prevent any chance of possible asphyxiation, vents are sometimes provided when the garage is built so that there will be some means of escape for gas when windows and door have been kept closed in cold weather. Windows should correspond in type to those of the house. By having the upper sections of the garage doors glazed additional light can be provided. The usual height for windows from the floor is 4'.

The subjects of artificial lighting, heating, and plumbing are discussed in Chapter IX. It is obvious, however, that these should be planned for along with the other interior details. With regard to radiators, it is thought by many to be wiser to have them placed near the ceiling rather than on the floor in the usual way. In a small garage, the overheating might

prove dangerous to the car. The placement of a wash basin, hose connection, and lavatory is convenient. Such provision is shown on some of the plans detailed herewith.

Doors are discussed at length in Chapter VIII. In addition to the regular car entrance, there may be a service door at one side or the other end of the building. If the garage faces away from the house or if tool or work rooms have been included, this door proves quite useful. Of course, where the garage is attached to the house, there may be a self-closing, fire-proof door between the house proper and the garage. The placement of this door sometimes offers a problem, but it serves to best advantage when leading into a separate vestibule or hallway.

A very useful adjunct to any garage is a work bench, which requires little extra space. In planning for this in a small building, it may be put on either side or back as seems most advisable. It can be used to better advantage when adjacent to a window. A good average bench can be made to occupy a space 5' x 2' and space provided beneath it for accessories for oiling, greasing, and cleaning the

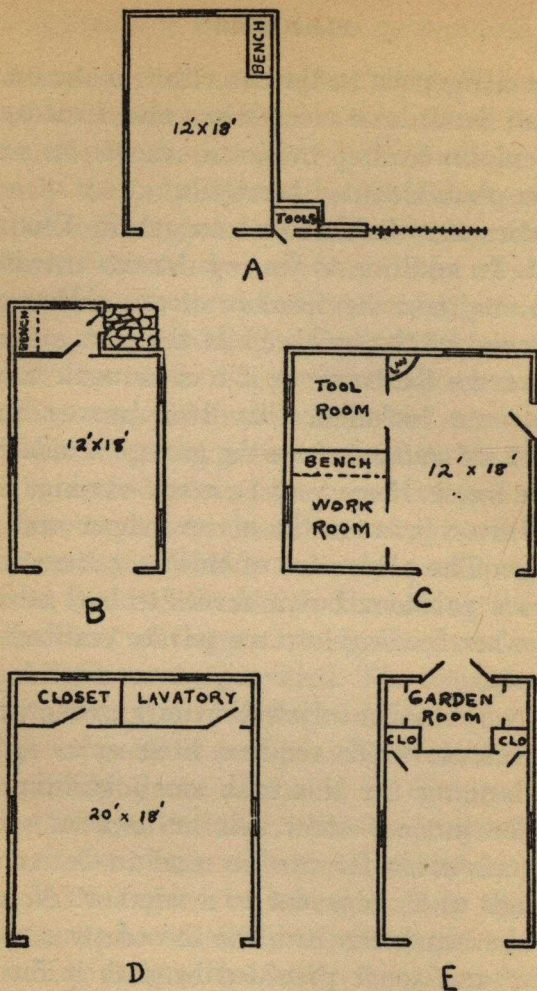


FIGURE 5. Floor plans for detached garages.

car. Extra space on the same side of the building can be utilized nicely for a closet for tools, tires, clothing, and incidentals.

The addition of a workroom, or toolroom, helps to alter the lines of what might be otherwise a very uninteresting structure. In Figure 5 (B) we have the plan of a building that was made narrower at the back and this narrow portion served as a garden workroom. There is a door in the side of it opening on a terrace with a vine-covered pergola. This made a charming retreat at little extra expense and formed a very delightful view of the garage from the house.

Where the workroom is added at one side of the plan, it gives width to the front of the building and also may achieve distinction by changing the conformation of the roof lines. This side addition may be continued the entire length of the building, still keeping it rectangular in shape as shown in Figure 5 (C) or it may be just a small toolhouse added at the front as in Figure 5 (A), the artistic effect of which can be seen in the illustration.

The additional space can also be provided across the back side. This is a particularly good

arrangement where it is to be used for garden tools. It forms an entirely separate room which may be only approached from an outside service door. This allows ample space for lawnmower, wheelbarrow, and all the various implements and knick-knacks that the garden enthusiast collects.

Extra room in a garage may also be conveniently converted into a lavatory where there are plumbing arrangements. This becomes an especially useful feature for children. Another great convenience where there are children is closet and storage space for tricycles, wagons, toys, and the multitude of trinkets they collect from day to day. Toys survive much longer where their carefree owners are taught to take care of and put them away each night, incidentally aiding appearances around the yard.

If there happens to be enough available space under the rafters, especially where the roof has a high pitch, this may also be well converted to storage or some other useful purpose. A ceiling stairway can be installed which is easily pulled down to afford access to this space.

Planning the garage may also deal with more on the exterior than determining the shape and style of the building. Such items as fences, arbors, trellises, and any other outdoor furnishings must all come in for their share of attention. When the garage is semi-attached good use may be made of a covered passageway, which may even be used as an outdoor living porch in summer and affords protection from inclement weather at any time.

A very important point, not to be disregarded in considering garage plans and specifications, is the matter of costs. For most of us this seems ever to impose limitations. To the householder who really wants things, however, there is always a way out. If necessary, he can secure the bare materials and the labor can be his own. Labor is always the biggest item on any home improvement or repair jobs.

It is rather difficult to apply to garage construction the usual yardstick for roughly estimating costs. Rather is it easier to make out a material list and secure estimates thereon. Costs may differ considerably in different localities. When forty-five or fifty cents per cubic foot might be the basis for estimating

frame construction in sections around New York City, in other places it would no doubt come to less.

Generally speaking, the expense of various forms of construction rates in the following order:

Wood construction with outside of shingles, siding, or stucco.

Cement blocks stuccoed on outside.

Brick veneer.

Brick construction.

Stone construction. (This may be less costly than some of the others, depending on the kind of stone used and where secured).

Costs also are contingent to a large extent on just what the specifications are drawn to include. Most small detached garages are only rough-finished on the interior, and many do not have running water or lighting facilities. The amount of concrete work may also make a considerable difference.

A low initial cost does not necessarily indicate that the building has been economically erected. Cheap materials or poor concrete usually prove costly. It is certainly better

policy to pay the small additional cost to get materials of good grade and to use durable methods of construction in the first instance.

A garage does not involve the complications of dwelling construction, so that even a novice can determine fairly accurately beforehand exactly what is needed. In buying lumber, extra allowance should always be made for wastage; and one must not be disappointed if the width or thickness of timbers varies as much as $\frac{1}{4}$ ". Securing several estimates may result in a saving and enable one to discover just where he stands.

Resourcefulness and good judgment can make a small sum of money go a long way. As indicated later on, it is possible for one to put up a small, single-car garage for as little as \$150.

V

THE GARAGE STRUCTURE

EXCEPT where the garage is built in as an integral part of the dwelling itself, it is constructed as a separate building which may be attached to the dwelling as a wing or ell, or may be entirely detached. This latter is by far the most common type, and its construction will be discussed here.

Structurally, the garage is a relatively simple type of building, yet there are many details pertaining to its construction that may be easily executed improperly or overlooked entirely. It is especially necessary, if one undertakes to build his own garage, to have at least a fair working knowledge of these details, so that the various steps in construction may be taken in their proper order and nothing be overlooked.

The principal steps in construction may be summarized as:

1. Setting the foundation wall.
2. Framing the building.
3. Covering the sides.
4. Putting on the roof.
5. Adding the finish work—trim, casings, doors, and windows.
6. Laying the floor.

THE FOUNDATION WALL

To have the garage in a location where it looks well and at the same time serves its purpose in the best way has been fully discussed in Chapter III. Having determined its general location and the side on which to have the main entrance, the first step is to decide on the type of foundation. This may be of poured concrete, cement or wood blocks, or brick piers. Concrete is used the most and forms a very satisfactory as well as durable base on which to set the garage framework.

In the case of cement blocks, if laid on a filled-in base, it should be well-tamped and solid. A concrete footing forms the best footing for the foundation wall. The mortar should be laid on the inside and outside joints of the

blocks only. The mortar joint does not need to go through the entire thickness of the wall.

Laying Out Foundation. The outside dimensions for the foundation can be indicated by lines stretched between stakes placed a foot

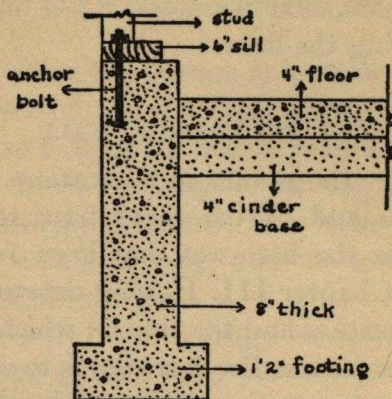


FIGURE 6. Section of concrete foundation wall and floor.

or more back from the lines. It is a frequent practice to lay the floor and set the foundation in one operation; but the practice recommended here is first to set the foundation and build the garage, then lay the floor as a final step.

Dimensions. A trench will have to be dug

for the foundation; then forms should be constructed for the sides of the wall, allowing for a width of about 8". The footing at the base should be at least 1'2" wide as shown in Figure 6. In cold climates, the foundation wall should be set 3' or more below the surface of the ground to avoid any danger of being affected by freezing of the surface of the ground; otherwise, one half this depth will be adequate. Have the top of the foundation wall a minimum of 2" above the surface of the ground and level all the way around. If desired, the top may be as much as 6" higher so that, after the floor has been laid, the wall may extend 4" above the level of the floor. Allowance, however, must be made wherever there are entrances to the garage so that the tops of the foundation and the floor coincide.

In laying out this rectangular base, it is extremely important that the sides be true and form square corners. A convenient test is to measure the length of both diagonals which should be exactly even. As to the kind of concrete to use and the method of its mixing, consult Chapter XI.

Anchor Bolts. In order to tie the garage

down properly to its foundation, $\frac{1}{2}$ " bolts about 12" long should be set in the concrete heads down to a depth of at least 5". These may be placed at intervals of 5' and 3" in from the outside edge. The sills are then fitted down over these bolts and the nuts screwed on tightly.

Allow the concrete about three days in which to "set" before the framing is started.

Brick Veneer. In the event the garage is to have a brick veneer instead of wood construction outside, then the foundation wall should have a width of 10". In this case, use a 4" by 4" sill and, while the tie bolts are probably not as necessary, they are still desirable and should be placed in 2" from the inside of the foundation wall. A 5" space must be left on the outside of the top of the wall on which to lay the brick work.

Placing Sills. Ordinarily use a 2" x 6" sill (though a 2" x 4" will do). Set it flat and flush with the outer edge of the foundation wall. See Figure 6 for the exact arrangement. Holes $\frac{1}{2}$ " through, of course, have to be drilled at the exact points where the sill fits over the projecting bolts. The sill should be cut out

wherever there is a service door, and also for the entire width of the main entrance doors. Creosoting the lower side of the sill, which rests next to the concrete, will add to its durability.

Anchor Plates for Studs. As an alternative when the foundation is of concrete, the use of sills can be entirely obviated through the use of anchor plates to hold the studding in place. The base of this anchor arrangement is set down into the concrete when soft and is then spiked to hold it in place. The top section of the anchor has a U shape into which the stud fits. The stud is then held rigidly in place by bolts which go through the two sides of the U plate and the stud at the same time.

This same arrangement can also be used for corners by setting the anchor in from the end $1\frac{3}{4}$ ". Then a stud is fastened in place in the regular way. In the corner position a second stud is then set alongside the first and nailed to it. This second stub has to be cut out slightly at the bottom to accommodate the plate to which the first stud has been fastened.

In many ways, this method of securing the building to the foundation is more satisfactory

than the sill method with bolts set in the concrete. These anchors can be secured ready made from hardware supply houses.

THE FRAMEWORK

Placing Studs. Good construction calls for the use of 2" x 4" studs to be placed 16" from center to center, though there is no harm in allowing up to 20" for their spacing in garage construction. The height of these, for ordinary purposes, should not be under 8'. The studs are nailed to the sill at the bottom and held in place at the top by a 2" x 4" plate. The provision for window and doorway openings is made as shown in Figure 7. The sills of the windows should be 4' from the floor. The height of any service-door opening should not be less than 6'6". A level should be used frequently to plumb the studs into position.

Framing on Ground. For the amateur who is building his own garage, it may be found expedient to do this part of the framing on the ground. Where this is done, the best plan is to frame the sides of the garage first. The sill should then not be bolted down, but made a part of the framework. When finished,

each side frame can be raised into position, the sills fitted down over the bolts, and temporary bracing used to hold them in position. Then the end frames should be built and set in position. Where this procedure is followed care

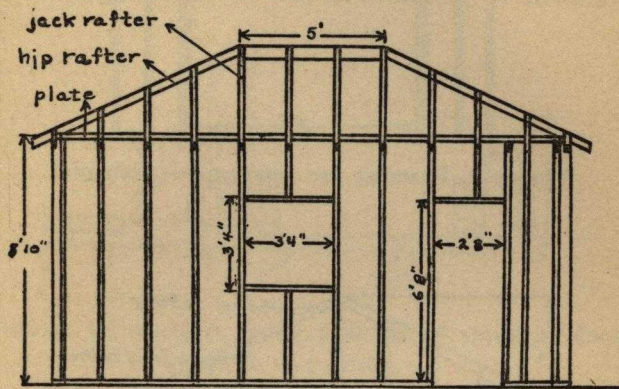


FIGURE 7. Framing for side wall.

must be taken to have the corners trued up square.

Diagonal Bracing. Bracing with 2 x 4's nailed diagonally between the studding on each side of the corners is not essential ordinarily. If the structure runs to two or more stories in height, however, this should be done.

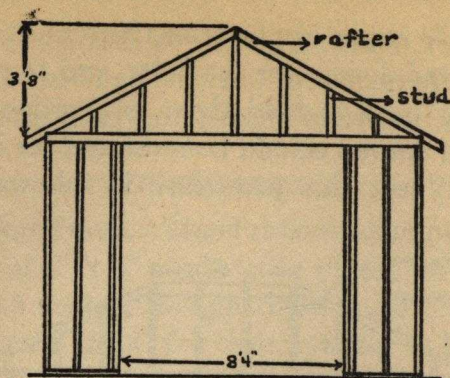


FIGURE 8. Framing for front end—gable roof.

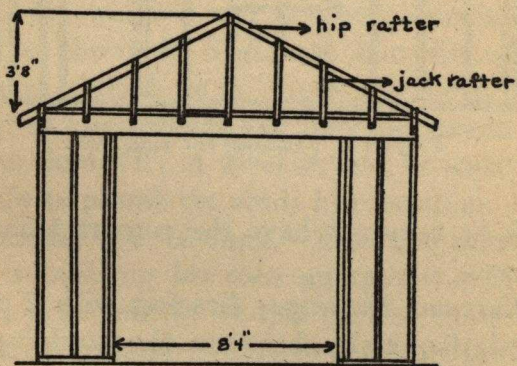


FIGURE 9. Framing for front end—hip roof.

Corner Studs. The studs that come at the four corners may be variously joined. The arrangement shown in Figure 10 is good for most purposes. Where the interior of the garage is to be finished up, this arrangement, allows ample surface for the nailing of lath on

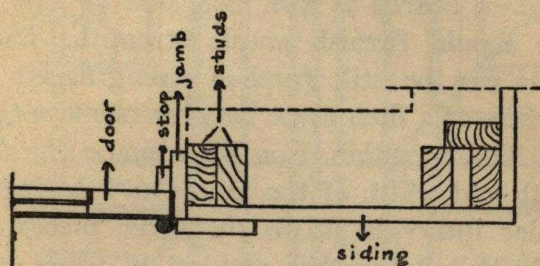


FIGURE 10. Section giving position of studs at door jamb and corner.

both sides of the corner inside. Especial pains should be taken to have all corner studs plumb before nailing.

To provide ample strength in the sides of the frame to which the main doors are hinged, it is well to set two studs together. In fact, there should be double studding at the sides of all door openings. Note Figure 10 for suggested framing of door jamb and a corner.

For the plate at the door head a 4" x 4" timber can be used or two 2 x 4's set together on their sides. If there happens to be much space between the door head and plate, truss work should be used. A strong door head is especially necessary in a two-car garage. In this case, two boards 2" x 8" laid side by side on edge should furnish ample strength. These beams can be still further strengthened by insertion of a fitch plate between the two timbers. This is a thin, iron plate made the full length and width of the beams and drilled at regular intervals. With the three pieces securely bolted together and set in place, one could not wish for a more substantial head piece.

Tie Pieces. The framework for the sides and ends being in place, three or four tie pieces (2 x 4's cut to the width of the garage) should be nailed to the plates of the framework on both sides. These are to counteract the thrust of the roof and keep the sides from spreading outward. If the garage is to have a ceiling, then joists 2" x 6", placed the same distance apart as the studs, are necessary.

Where the sides of the garage are of uneven

height, making the sides of a gable roof of unequal size, it will be impossible to attach the tie pieces to the sills on either side. In this case, instead of 2" x 4" lumber, 1" x 6" pieces

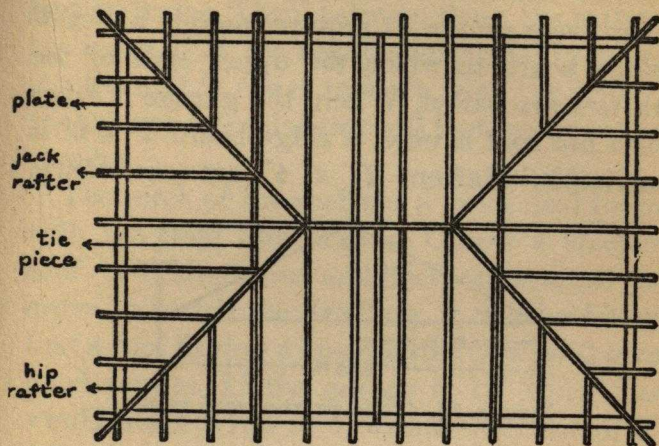


FIGURE 11. Framing for hip roof.

will be sufficient, nailed to the rafters on each side.

Roof Framing. There are a number of roof styles, of which those in most common use are the gable and hip forms. The gambrel type roof is occasionally used. It is especially good where there is to be a room over the

garage. The type of roof, of course, should reflect that used in the main dwelling. With the gable type, additional studding is necessary on the ends above the plate and the door head.

The framework of a gable roof is comparatively simple. It requires merely a 1" x 6" ridge board to which the upper ends of the rafters are nailed. Where the garage is large or a hip roof is used, a ridge board 2" x 6" is advisable. Rafters 2" x 4" are customary.

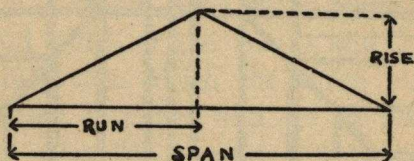


FIGURE 12. A one quarter roof pitch.

Where the lower ends of the rafters touch the plates, right angle notches are cut out so that they will rest flat against the top of the plate. How much the rafters shall extend beyond the plate is a matter of individual choice. A short overhang is much in vogue and looks very well when nicely finished up.

With a hip roof, the framing becomes more complicated, but the results are usually better

to look at. A study of the layout given in Figure 11 will convey the idea much better than words. In this case, the ridge board is much shorter. From each end of the ridge, hip rafters extend to the four corners of the garage frame. Then, between these, the rafters are inserted at the regular intervals. In placing them, it is easier to start from the center, so that any irregularities will then occur at the corners.

The pitch of the roof has a great deal to do with the final appearance. Unless a steeper roof is desired for architectural reasons in order to match the dwelling, it will be found that a roof having a one-quarter pitch will give good results. If the garage is 12' wide, this would mean a run of 6' with a total rise of 3' (the rise being 6" to every foot of run).

VI THE GARAGE STRUCTURE

COVERING THE SIDES

THE material with which the outer sides of the garage are covered should be primarily determined by whatever has been used on the dwelling. It will probably be of wood, stucco, brick, or stone. Where the construction is wood, the sides to be covered will probably be composed of sheathing overlaid with either shingles or siding. This last-named comes in a variety of styles and should, of course, be chosen to match that on the house. White pine is good lumber for this purpose and very satisfactory to work with.

Siding. In using siding, the best plan is first to cover the studs with sheathing laid diagonally, over which heavy building paper is tacked. The paper helps to keep out wind and makes the garage a bit warmer. Siding is laid working from the foundation up to the

rafters. All joints should be cut to meet where both ends can be nailed to a stud. And it looks better not to have all the joinings on the same stud but at irregular intervals. The sides should be evenly butted together. At the top, cut out the siding to fit tightly around the rafters so as to close up all space between the plate and the roof. Where the corners are to be faced with trim, cut off the siding on both sides so that the edge will be flush with the edge of the stud; this also applies to window and door openings. Otherwise, miter the siding flush at the corners so as to form a square angle.

Shingles. Where the garage is to have an outer covering of shingles, sheathing should be also laid on the studs as the initial step. It may be put on either diagonally or horizontally. Number 2 grade lumber 1" x 6" is good enough for this purpose. Common shiplap up to an 8" width, well-nailed to the studding, also forms a good base on which to lay the shingles.

Shingles are laid beginning with a double row at the bottom and working toward the roof. Not more than 6" of the shingles should be exposed to the weather, and the joints

broken so that they will not coincide on successive rows. In this case also, the shingles should be fitted around the rafters at the top so as to close up any intervening space. On all shingling work, zinc or copper nails should be invariably specified for durable results.

Stucco. Where the finish is to be stucco, the sides should first be covered with sheathing, then the galvanized metal lath to hold the stucco is nailed over this. The stuccoing process usually consists of two layers of cement, over which a final coat of the stucco containing the desired color is laid. Instead of this latter coat, special paint for this purpose may be used. The outside trim around window and door openings should be nailed in place first and the stuccoing finished up flush against the edges.

Brick. A brick veneer always gives a substantial appearance and is a permanent way of finishing up a garage. Sheathing covered over with building paper is put on first. The wall is laid on the top of the foundation, allowing for an air space of one inch. This form of structure does not resist internal fires more than others, but does offer good resistance to

fires on the outside. Figure 13 shows the accepted form of brick veneer construction recommended by the Building Code Committee of the Department of Commerce.

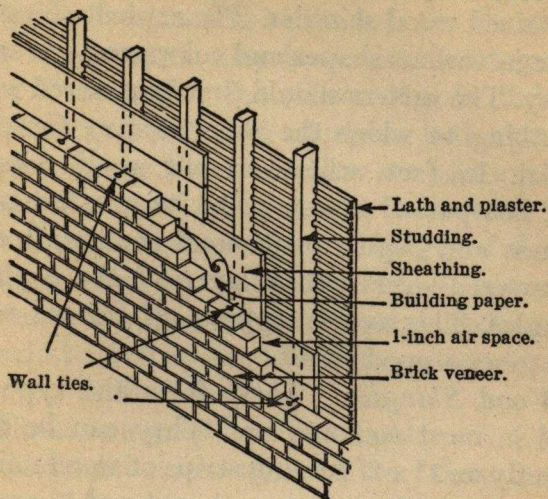


FIGURE 13. Method of brick veneer construction approved by the Bureau of Standards.

THE ROOF

A slate or tile roof is more expensive than other kinds and requires that the rafters be extra well braced; but should be used where warranted by the architectural conditions or where fireproof construction is wanted

throughout. A roll roof is probably most inexpensive, but does not look well.

Asphalt Shingles. These are often used and aid fire protection, but do not look as well as stained wood shingles. The asphalt shingles come in various shapes and colors and are easy to lay. The rafters should first be covered with sheathing to which the shingles may then be nailed. In fact, where an old wood shingle roof has passed the stage of its greatest usefulness and begins to demand repairs, it can be covered over with a layer of the asphalt shingles. This avoids ripping off the old roof and gives a good result.

Wood Shingles. These form the type of roof in most common use. They can be laid directly on 1" x 2" furring strips of wood nailed crosswise on the rafters and centered 5" apart. The furring strips should begin just above the lower end of the rafters—about 1½". A narrow overhang on the sides looks better and can be finished up neater. In the case of a hip roof it will be found best to lay the two sides first, sawing off the edges on a slant to leave them flush with the edge of the hip rafters. Then both of the ends may be treated likewise.

To get the rows of shingles nailed evenly against the boards, it may be found convenient to use a chalk line. Laying the shingles with about 5" to the weather is the usual practice with the overlapping at the top. On the ridge, two ridge boards may be used nailed together in a V shape; or the ridges may be finished with short lengths of shingles laid at right angles. In the latter case they are laid working from the ends and lapping over each side alternately. In the center a 5" length of shingle is cut to close up the last intervening space. In the case of a hip roof the ridges at each corner should be first covered, and the center ridge at the top finished last.

To have a good, weather-tight roof, copper flashings should be used on the ridges and in any valleys.

Shingles should be stained prior to using, and if a color is desired this can be mixed in with the stain. Pigments specially adaptable to this purpose only should be used.

FINISH WORK

The amount of trim used on the garage depends on how well finished it is to be. All the

corners and casings should be trimmed, and it looks much better to have the cornices nicely finished up. In fact all exposed timbers should

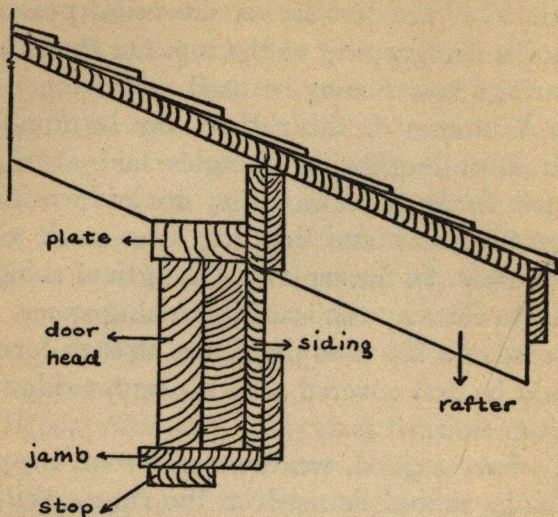


FIGURE 14. Section through eaves and door head.

be surfaced in some way. White pine is good material to use for this purpose.

Corners. With brick and stucco construction, no corner trim is necessary; and it is frequently not used with shingles or the drop siding. The shingles are merely trimmed down so as to form a good close joint at the corner

or, in the case of siding, it is sawed even so as to form square corner joints. Where corner trim is used over siding, a 1" x 4" board should be used on the side and a 1" x 5" board for the front. To secure a tight, well-fitting joint the boards should be sawed to size and nailed together in a V shape before being attached to the building.

Window Casings and Jambs. Ready-made window sash already glazed can be bought at any lumber yard that handles mill work. They come in various standard dimensions, so the size of the opening should be adjusted to accommodate the window size selected after allowing for the casing. The latter is a 1" x 4" piece placed upright on the outside sides of the window opening flush with the edges where the siding has been sawed off. Across the top is the head casing and above this a drip cap should be placed. At the bottom is the sill, usually 2" x 6", cut out at each end to fit around the casing. Flashing should be placed in the siding joint, nearest to the top of the window head, and brought down over the top of the drip cap. And the right kind of a window sill will have a groove about $\frac{1}{4}$ " in

from the edge on the under side to catch and drain off water running over the sill.

Next to the studs on the sides and upper part of the opening, the jamb is placed, about 1" x 5" material being used. It is against the sides of the jamb that the window sash works. To hold the sash in place 1½" x ½" window stop is nailed in place on the jamb. Figures 15 and 16 show sections giving the relationship of these various window pieces.

The easiest way, of course, is to buy the sash and frames already made and fitted, so that it only becomes necessary to set it in the opening left in the wall space for this purpose. One only has to use care to have made his measurements such that the wall framing around the window space is accurate. Sash and frames come ready-made in standard sizes.

Casement windows, especially adaptable to brick construction, are frequently used. They are not always as weather-tight as might be wished, but make a very good appearance on a small structure such as a garage.

Door Casings and Jambs. These are attached in a manner similar to those for the window opening. Hinged doors swing out and

are fastened to the door jamb. A 1" x 3" stop is nailed to the jamb against which the door fits. The crack between the doors themselves can be closed by an astragal nailed to the door on

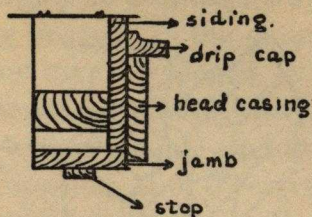


FIGURE 15. Section through window head.

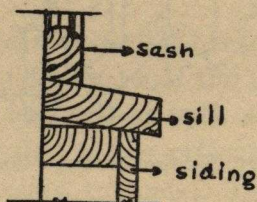


FIGURE 16. Section through window sill.

one side and lapping over the other door. The doors should be fitted so as to work freely, allowing for ample space at the bottom.

In the case of a two-car garage, a center post is necessary only if both sets of doors are to be hinged. Where automatic door devices

are used or the doors work on tracks, only one opening is necessary for both sets of doors.

Doors. The garage doors that are bought out of stock are usually about as beautiful and unusual as the classified ad pages in a news-

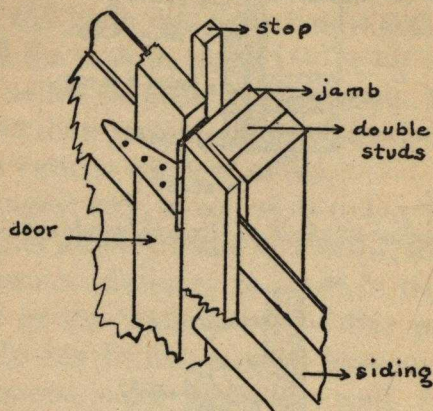


FIGURE 17. Section through door jamb.

paper. They should be $1\frac{3}{4}$ " thick though the panels may be of thinner material. Where doors are hinged, at least three pairs of hinges should be used to each pair of doors. For holding doors open, overhead patented braces may be used, or a low post set in the ground having a hook that can be attached to the lower part of the door.

Service Door. Where a service door is not provided as a part of the main entrance, it is sometimes very useful to have a separate entrance to the garage elsewhere. The door may be of standard size and where space allows should swing inward. If the garage is small, then the door may be hinged to swing outward. While not absolutely necessary, it is just as well to have double studding on either side of this opening also. There should be a drip cap, flashed, over the head casing, and door stops attached to the jamb in the appropriate places.

Cornices and Eaves. Where there is a wide overhang on a gable roof, the under part on the ends can be finished with a facing board and the lower side of the rafters cased in with $\frac{5}{8}$ " beaded ceiling material. The lower sides under the overhang can also be boarded in with matched lumber and a facing strip placed along the ends of the rafters.

The tendency, however, seems to be toward short eaves and overhang, which makes the finishing up of the cornices simpler and requires less material. Where the eaves are short, 1" x 4" pieces should be used in the space be-

tween the rafters. Then plain strips or molding can be used between the ends of the rafters and the top of the siding. Certainly it adds greatly to appearances when care is taken to finish up cornices and eaves neatly.

Hanging Doors. Garage doors should be hung so that they have ample play and work freely. Except on the hinge side, which may be figured closer, at least $\frac{1}{8}$ " clearance should be allowed. More clearance is advisable at the bottom, as the large hinged doors sag in time. Especial care must be observed in putting up doors to have the hinges placed accurately; otherwise they will bind. The use of a plumb line may be helpful in correcting their alignment.

Gutters and Leaders. These are not absolutely required on a garage; in fact they are customarily omitted from most small garages. But we have been outlining methods of durable construction that would be followed in the building of any good house and that should be followed in a garage if it is to be built likewise. And a properly finished garage calls for gutters and downspouts for the same good reasons.

Half-round 2" x 4" copper gutters are best for ordinary purposes. The downspouts should also be 2" x 4" and lead either into a dry well or a tile drain which will carry the water to the street. Wood gutters may be used that will be less conspicuous; but a lining of copper or some rustproof metal should be specified. The box type gutter with the downspouts running down the back side will probably look the best.

The use of copper flashings at appropriate places has already been mentioned. While the home owner doing his own building can handle this sort of work, it will probably save a few heartaches and not cost many dollars extra to have it done by a tinsmith who understands just what slant to give the gutters and how to cut and solder on the downspouts.

THE FLOOR

For all-around purposes, it seems to be agreed that the garage floor of concrete serves the best. It is durable, easy to clean, and non-combustible. A wood floor is highly impracticable, and its facility for soaking up oil adds to the fire hazard; also it decays more readily.

A dirt floor is nature's best and has the advantage of costing so little it amounts to almost nothing at all. One of the main disadvantages is that in many locations it creates a drainage problem and is usually damp. A drainage pit can be made in the center by digging a hole a few feet square and filling it with rocks, then covering over the top with a grating.

To prepare for a concrete floor, remove the soil to a depth of at least 8" below the top of the finished floor level, which should be 2" above the surface of the ground. To insure best results it is a good plan to have sufficient soil removed so as to permit of a 4" cinder base or gravel fill, to be well tamped down. The thickness of the concrete should be 4" or more. The whole arrangement should be planned so that the top of the floor will not only be higher than the surface of the ground, but so that it will be $\frac{1}{2}$ " to 1" above the runway.

Proper provision must also be made for easy draining of the floor. This can be handled by giving the entire floor a slant toward the doorway, or by slanting the floor in from the four sides toward an iron grating in the center.

Pitching the floor $\frac{1}{4}$ " to the foot will be sufficient for easy draining. If you choose the center drain, it should be connected by a tile line or drain pipe to the sewer; otherwise a dry well must be installed.

A dry well may be made by sinking a barrel into the ground having its sides well drilled with holes, its bottom knocked out, and the inside filled with rocks. A coarse heavy wire netting can be placed over the top of the barrel to reinforce the concrete. A bricked-in pit with a 10" grate set in the top also serves the purpose.

The floor can be made of 4" of poured concrete, or 3" of concrete can be laid and covered over with a 1" surfacing of cement. If desired, lampblack may be mixed in this cement to give it a darker tone, so that it will not show up dirt and oil so easily. The mixing of cement and concrete is fully described in Chapter XI. Ample time should be allowed for the concrete to become thoroughly set before it is used.

If a strike is needed to receive a footbolt, it should properly be set in place while the concrete is soft. This will not be in the exact middle but 2" or 3" to one side, depending on

the door arrangement. The footbolt can be screwed onto the bottom of the door after it has been hung so that it will be in the right position to enter the strike correctly.

Where space has been allowed for a workshop along one side, or at the end, or there is a small room in addition to the garage, it may be found advisable to have a platform or flooring built over the concrete. Soft pine flooring up to a 3" width laid on 2" x 4" sleepers should be satisfactory for this purpose. Common shiplap may also be used here.

A good concrete floor can be cleaned without too much trouble and kept as neat as any floor in the house. Oil and grease may be removed with kerosene and a scrub brush plus vigorous application of both. Then flushing out the floor with a hose should leave it such that the householder could lie on it in his Sunday best.¹

¹The authors are indebted to Stanley W. Newman, engineer, for valuable suggestions used in this and the preceding chapter, and for advice on the technical matters covered.

VII

MORE ABOUT CONSTRUCTION

IN THE two preceding chapters, we have aimed to cover the process of construction following along accepted lines. There are, however, several other items that must be taken into consideration if this presentation is to be complete, but which are for the most part items that are optional with the owner. A great deal can be done to the garage by the owner himself toward making it a more purposeful feature of the home. Chapter IV on planning gives some hints to this end. With the owner himself doing the labor, the added expense of various betterments need not be great.

THE INTERIOR

As a general rule, no pretense is made toward finishing the interior of garages. At least until the advent of attached garages, they were usually nothing but rude, barn-like structures inside. In the former case, unless the

garage is a part of the cellar, when it will have concrete or masonry walls, it is given an interior plaster finish similar to that used in other portions of the house. But the interior appearance of the detached garage has ever been one of its most neglected features. Even some inexpensive form of wallboard nailed to the studding around the inside helps.

Wall Finishes. With the tendency to locate the garage in the dwelling itself or within a radius so that it can be heated from the house plant, the interior finish becomes a matter of greater importance. If the garage is to secure the greatest benefit of its heating arrangement, it should have some form of insulation, the same as any well-constructed house now has, and this in turn implies an interior wall finish. This may be a rough plaster, wallboard, or merely matched boarding. There are a number of styles of dressed and matched lumber that do very well for this purpose.

In fact, whether the garage is heated or not, the tighter the walls, the better they will retain heat, though this is probably not so necessary in warm Southern sections.

Ceiling. If the walls are to be finished up

in some way, it follows that there should be a ceiling. Where the studding is the same height on both sides, a ceiling can be installed with but very little difficulty. It merely requires 2" x 6" pieces laid crosswise, with the same spacing as the studs, and nailed to the top of the plate at each end. Then to these is attached the ceiling material which may be lath and plaster, wallboard, or wood. If the latter, tongue-and-groove beaded ceiling material serves the purpose well.

Attic Space. Many garages will permit of some attic space. And, where a ceiling is to be put in, this can be easily provided for at the same time. Instead of the 2" x 6" ceiling joists, however, joists 2" x 8" are requisite if the garage is large, and should not be spaced over 16" apart from center to center. The studs should also have been spaced likewise. In the case of a two-car or unusually wide garage, these ceiling joists should be braced through the middle. An opening must be left at one side or at some convenient point in the ceiling in which to install a ceiling stair. Access may also be provided by a ladder run up one side to a trap door and in other ways. The ceiling

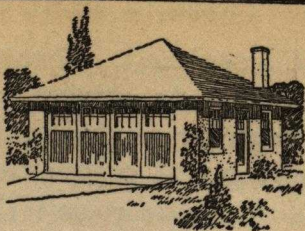
of an attached garage should never be pierced by any openings.

Partitions. These are sometimes quite desirable where there is to be special space set apart for a workroom or for other purposes; or if one half of a two-car garage is to be rented, a wall between may be very convenient.

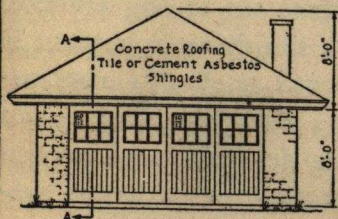
The framework for a partition can be made by laying a 2" x 6" sill on the floor, fastened at the ends and spiked into the concrete. Studs, 2" x 4", can then be set in place and fastened at the top by the usual plate. This studding does not necessarily have to be placed as close together as that in the outside walls unless the partition is to support joists for an overhead room. The sides of the partition may be covered as desired, or as costs may dictate.

Staining. Very few are the modest garages whose interiors have felt the stroke of a paint brush. Whether one has the interior painted or not, it certainly helps appearances if a coat of stain is applied to all exposed woodwork. Plaster work will probably be rough finished and may have a color mixed in before it is applied.

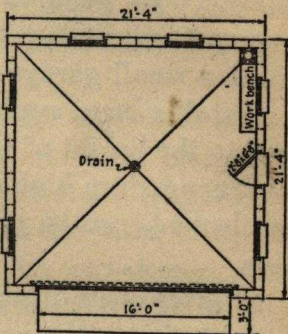
• PLAN OF A FIRESAFE •
 • TWO CAR GARAGE •
 • BUILT OF •
 • CONCRETE MASONRY •
 • AND •
 • PORTLAND CEMENT STUCCO •
 • PORTLAND CEMENT ASSOCIATION •



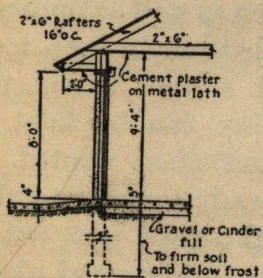
• PERSPECTIVE VIEW •



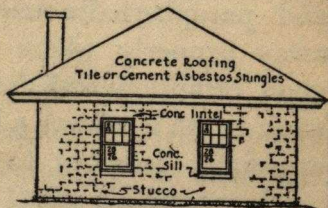
• FRONT ELEVATION •



• PLAN •



• SECTION A-A •



• REAR ELEVATION •

FIGURE 18. Plans of fireproof concrete detached garage recommended by the Portland Cement Association.

Conveniences. Chapter IV gives some consideration to arranging for a work bench, storage for garden tools, the installation of shelving and cupboards, and other ways of utilizing extra room inside the garage. When space permits, it helps the cause of orderly appearance to build in cupboards or shelving, and certainly it is a great aid to convenience. With a small garage a simple arrangement is to install a large cupboard or closet across one end to the height of the studding. Shelves can be arranged up high on the inside and garden implements can be put away in the lower portion.

It saves one's disposition as well as unnecessary strain on the bank balance to keep tools and paraphernalia used around a car put away properly where they can be kept in good condition and found when wanted. A work bench is always a handy accessory and is especially essential to the man who works much around his car. The building and placement of these various conveniences must be left to the ingenuity of the home owner, as he will have to adapt them to suit his own accommodations.

Floor Pit. Another convenience to the home owner who is also a mechanic and works on his own car is a pit set in the floor. This should be lined with concrete and planned for when the floor is laid. The floor drain may then be placed in the bottom of this pit. The inside width should be between 24" and 30" and the depth up to 4'. Steps located at one end will be helpful.

When not in use it is a good plan to have a cover to fit over the top. A wood cover that has been enclosed in sheet metal is good for this purpose. It may take the place of a drip pan, and this prevents the unwelcome accumulation of oil and grease in the pit. Such a cover is easily wiped off and keeps the pit clean.

THE EXTERIOR

As already indicated, the exterior appearance of the garage is coming to be considered important, especially since becoming an integral part of the house in so many instances. It has even come to be recognized that the garage should be given architectural treatment and so have unity with the house itself.

Therefore, more and more attention is being paid to its design and ornamentation.

A garage already built may have the crude lines of a packing box, but even these can be modified and made less objectionable by the use of a little judicious planting and a carefully placed rose trellis or two. There is no good reason why the garage should not be planted to harmonize with its surroundings.

Entrance. A small pergola erected directly in front of the entrance may do a great deal toward eliminating the severe plainness of an otherwise unattractive doorway. The doors of the ordinary small garage are frequently its least appealing feature on the outside; but when framed with a vine-clad pergola or arch, they can be given a recessed effect that takes away any obtrusiveness.

Doors. Swinging doors, being the most inexpensive and practical, are naturally found in greatest use. The fixtures are easy to secure and simple to attach and repair. It is not recommended that any home owner attempt to make his own doors, as a set of good doors can be purchased for upward of \$25 that will probably be far superior to anything he can

make. However, if not satisfied with stock doors, he can draw up his own pattern and have it made up at a mill, though this will very likely double the cost.

In the succeeding chapter are described the principal kinds of folding doors and automatic devices for their control. Some of these require special tracks and other arrangements for their accommodation. These special doors are generally accompanied by directions for their installation and so can be put in place by the home owner himself. In framing the door opening, it is always an advantage to provide plenty of strength in the sides and the door head so as to take care of any demands out of the ordinary made by the type of door selected.

In addition to the suggestions already made, there are still other touches that may be given to the outer appearance of the garage that will give it character—a friendly air that makes one feel that it is actually a part of his home scheme. The design of the doors themselves will do a great deal in this direction. A cheery box of flowers placed under each window, a weather vane on the peak of the roof, a bird house or two tucked around the corners

of the eaves, and perhaps a vine ambling its way across one side—one or all of these will contribute a share in humanizing our garages.

PAINTING

The new garage of exterior wood construction should have at least three coats of the best lead-and-oil paint, except where covered with shingles that have been previously stained. Inasmuch as paint acts as a preservative and protection against the weather, as well as greatly improving the appearance of a building, it is important to exercise care in the choosing of materials and in their application to the surface of the wood.

It is well worth the difference in cost to specify a reliable brand of paint, as cheap paint turns out to be only too costly and barely lasts through a single season before the job has to be done all over again. If a new wood surface is started out right, it should not require repainting for three or four years. And it is better to repaint with two coats of paint at less frequent intervals than to repaint oftener with but a single coat.

Generally speaking, a gallon of ready-

mixed lead paint can be counted on to cover about five hundred square feet of surface. This figure will vary on different woods or where one is repainting old surfaces.

Weather. Favorable weather conditions are particularly necessary to exterior painting. The season of the year does not matter if the temperature is not below 40 degrees, or subject to sudden cold spells, and if the air is dry. Moisture is the chief cause of painting difficulties, and not only should the weather be dry, but the wood should be thoroughly dried out, before paint is applied. New wood, however, should not be left too long before receiving its priming coat, as it becomes cracked and warped.

Choosing Paint. The main color chosen should, like other features of the garage, be similar to that used on the house. A second color may be sometimes used on trim and door panels to good effect.

For the householder doing his own work, the use of good, ready-mixed paints is recommended. Their consistency seldom has to be altered except for the priming coat, when thinning with up to 25 per cent linseed oil

is advisable. Thinning paint for the subsequent coats with turpentine or any other liquid alters the texture of the finish and is rarely necessary. Paints mixed especially for outdoor purposes only should be used.

Preparing Surface. Where the surface is new, the main requisite is to have it clean and any rough places sandpapered down. Nail holes should be puttied. Knot holes or pitchy places in the wood should be first covered with turpentine or shellac. Old surfaces in fairly good condition can be cleaned and repainted; but, where the surface is in bad shape, the old paint should be first entirely removed before building up a new finish.

Applying Paint. The initial coat of paint primes the wood and forms the foundation for subsequent coats. Adding more oil to this first coat is good for the wood and makes a better base. It should be well brushed out and ample time up to a week allowed for thorough drying. The second is the body coat, and the third gives the finish, so it should be applied with especial care.

The life of the outdoor paint job depends somewhat on the quality of the paints and the

number of coats applied, as well as the weather conditions to which it is exposed. Just as soon as the finish begins to crack and scale off, then it is time for another coat.

Any exposed metal surface such as iron or tin should also be covered with special paints for this purpose. Copper, lead, or zinc gutters and leaders do not require painting. Stucco and cement surfaces may also be painted, though it is better not to apply the paint too soon after they are new.

OTHER TYPES OF CONSTRUCTION

The most durable materials out of which to build a garage are stone, brick, and concrete. When the circumstances warrant the use of these materials and cost presents no special limitations, any one of them is to be preferred to wood construction. For the most part these materials require skilled labor for their proper handling. They are durable, afford the best protection against fire, and require less expense for maintenance.

Such construction has the advantage in some localities that building is permitted right up to the lot line; whereas fire laws require

inflammable structures to be built in several feet from the line. Fireproof construction, of course, becomes a necessity where the garage is built into the house itself. Where monolithic or concrete masonry is used, the outside surface can be covered over with cement stucco to give the finish and color desired. Reinforced concrete walls or partitions may be 3" to 4" in thickness. With brick construction, the thickness comes to 8".

Roofs. Garages of masonry construction should have a roof in keeping. The framework will be of wood, but the roof itself should be of slate or tile. Due to the extra weight, the rafters should be 2" x 6" placed on 16" centers. Ceiling joists, also 2" x 6", should be used. Other types of fireproof roofing, such as the asbestos shingles, do not look as well as either slate or tile with this type of construction.

READY-MADE GARAGES

There are on the market several types of ready-made garages—some are of metal and others are of wood. For these wood garages, the material may be secured all cut to size with doors, windows, and their frames already put

together. Paint and hardware are also furnished, together with directions for assembling, so that the home owner can in this way secure an inexpensive garage by furnishing his own labor. The total cost may be as low as \$150, not allowing for concrete floor and driveway. Portable garages are also made that come in sections and can be quickly assembled. These cost considerably more than the type previously mentioned.

ATTACHED GARAGES

Whether built right into the house or forming an ell to the house, attached garages should follow methods of construction similar to those used in the house. The only deviation will be toward meeting fire-code requirements. Walls, windows, and doors should all be fire resistant. Metal framework is desirable for doors and windows, while wire glass is best for the windows.

Many attached garages being in excavated portions of the house, the walls would be of masonry construction in any case. The interior walls and ceiling should be of $\frac{3}{4}$ " hard cement laid on metal lath. A sheet of asbestos laid

next to the studs under the lath materially aids the cause of fire protection. Partition walls may be of brick, hollow tile, or cement, plastered over on the outside. These walls should be unpierced except for a single entrance to the house. Hollow concrete blocks are sometimes used in all walls of the attached garage. They are inexpensive and prove very satisfactory. The one door allowed as a house entrance must be of fireproof construction. No glass should be used in this door and it must be kept closed at all times. In fact it is best equipped with a self-closing device. The outer doors should also be fireproof.

As a minimum requirement, the use of wood studding in the walls is all right if both sides are covered with metal lath and well plastered with gypsum plaster or Portland cement. The main requirement usually is that construction be such as will enable it to withstand the so-called one-hour fire test. Concrete, of course, is the best material for the floor.

In some localities, these fireproof requirements for garage construction apply also to the detached garage when placed close to the house.

While this type of construction is costlier than that used in the usual detached form of garage, when it is a part of the house the construction is greatly simplified and there is not so much of it. So it actually means getting a better-built garage for the same amount of money, or less, than would be expended on a separate structure of wood.

VIII

HARDWARE AND ACCESSORIES

AFTER the garage has been made fireproof, weather-proof, and artistic withal, there are still many ways of increasing its convenience and usefulness. Comfort in the garage is a real possibility and, after betterments have been made and we have come to rely on them, we wonder how life was ever bearable when they were nonexistent. Whatever equipment is put in around the garage, certainly the place to begin is with the doors. They are used continually and daily by all members of the family. And of the many devices that have been brought into being for their easy handling, at least one can be found for every need.

DOORS

This subject of garage doors is most important, for their very size forces them to our attention and their efficiency determines to a

great extent the success of the garage. They are usually about as artistic as barn doors when closed and present the same yawning appearance when open. One of the primary essentials is that they should work easily and quickly, and not merely be well-intentioned. There are several automatic kinds in the market now, and choice is a matter largely of personal preference. The minimum width for any set of doors is 8' and they should be at least that high.

The appearance of, as well as method of operating the garage door, has everything to do with the degree of satisfaction we derive from it. The accompanying designs are only intended to be suggestive. In one of them a basis may be found from which to solve your problem of design.

Infinite combinations can be made, depending upon your choice and the method of opening the door that has been decided upon. For the ordinary swinging door all of them form possibilities. Design F of Figure 19 is the most common one for this purpose. It may be helped somewhat by the way in which it is decorated—painting the panels dark and the rest a

lighter contrasting color which should correspond to the colors used on the house.

The panels, incidentally, may be of various designs—plain, made up of strips laid diagonally or to form a herringbone pattern, etc. Any out-of-the-ordinary decoration or design forms a welcome departure from the commonplace when appropriate to the rest of the building.

Where the light inside the building is poor, glazing the upper portion of the doors may help considerably. The windows do not need to detract from the appearance, but can help matters if attention is paid to their number, size, and shape so as to give artistic results. Doors may be absolutely plain as *B* or *J*, depending on their shape, the grain of the wood, or the decorative hardware chosen.

For the folding doors, sectional doors similar to *I* or adaptations of certain of the others may be used. For the parallel sliding doors, or the overhead doors where they are in one piece, an effect such as *A* may be attractive. Battened doors similar to *C* are good when given the right kind of a finish and are often found where English design is the theme.

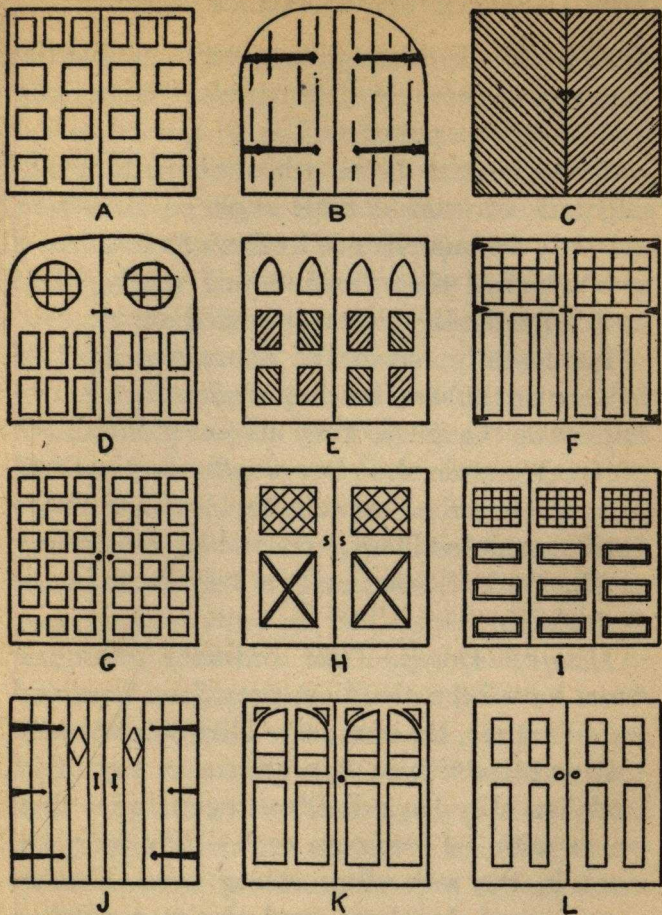


FIGURE 19. Suggested door designs.

Timbered oak doors give a very substantial appearance and lend themselves especially well to garage purposes.

These special types when made to order may run into considerable expense. However, not only we ourselves but others have to see a great deal of them, and money wisely spent in this particular direction is well spent.

Incidentally, when the doors are built of battens or timbers, much of their effect is contingent on the finish. They are not painted, but preferably stained. After weathering has had a good chance to contribute to the ultimate finish, results will be good or bad, depending on the kind of wood and its treatment in the first place.

Hinged Doors. The ordinary swinging doors have been the most prevalent type and are, of course, the cheapest. They can be made just as attractive in appearance as any other kind, but they have disadvantages. Since they are so wide—4' or more each—they are very much in the way when swung open. Due to sagging and shrinkage, and also to continued usage, hinged doors get out of alignment and sometimes are not as weather-proof as could

be desired. They are very much in the way with a two-car garage, especially, for they make driving in and out more difficult. But it is in the winter they are most troublesome, particularly when a bank of snow must be disposed of before they can be opened.

A proper hold-back is quite necessary to prevent them from blowing shut at the psychological moment. When open, they may be held in place by a pair of patented overhead braces or by a pair of door "dogs" which are fastened on the lower door corners inside. After the door has been opened, this "dog" or pin is tripped with the foot and immediately becomes caught in the surface of the driveway; and no wind or jarring will dislodge it.

Sets of hardware for hinged doors may be obtained costing from \$15 to \$100 or more. The hand-made wrought-iron hinges come high, but can easily make an otherwise plain door very attractive. It is highly desirable that all garage hardware should be as nearly rust-proof as possible. Brass fixtures always prove to be a good investment.

When iron hardware has become rusted, it should be cleaned with kerosene and sand-

paper and then painted with red lead followed by several coats of paint. In order to clean and paint them properly, hinges and other hardware should first be removed. If repainted every two years there should be no trouble from rust.

The list of hardware essentials for the swinging door should include:

1. Three pairs ball-bearing hinges.
2. Thumb latch for active door.
3. Safety hasp for padlock.
4. Top and bottom bolts for inactive door.
5. One pair door holders.

Ordinary screws the correct size may be used, or bolts with studded heads are effective when used with antique-reproduction hardware on an oak-paneled door.

Other Doors. While swinging doors have been the usually accepted type for many years, several new kinds have been developed. A number of the folding types are very practical. Overhead doors and those folding or sliding on tracks do not sag or get out of shape. Their method of operation also makes

them but little affected by wind and snow. On the whole they work easily and make unnecessary a struggle with doors before getting the car out. Those that fold or roll inward on tracks require additional length in the garage in which to be operated that is unnecessary to accommodate doors swinging outward.

These folding doors are hinged together in sections and fold as they slide on an overhead track from which they are suspended. To work properly, the sections should not be more than 3' wide and all of the same width. They may be supplied for any opening from 8' to 30'. These and some of the other types eliminate any need for center posts, thus greatly simplifying the entrance to a large garage while adding to the drivers' convenience.

For the single garage, the folding door comes in three sections. One of these may be used as a service door which opens in, and the other two are hinged together and fold back against the inside wall. They operate on an adjustable roller-bearing hanger and are very handy if kept in good working order. By having the proper hanger along the side of the garage these doors may be also made to

slide along against the inside wall at right angles to the opening. The service door may be either opened against the wall or attached to the other two and all rolled against the wall at the same time. As these require very little extra floor space in which to operate, they are very practical for the small garage.

There is an overhead door which is made in sections of either wood or steel. The latter is more suited to public garages than residences. This door is counterbalanced and slides on a track to a position up against the ceiling. It is tight-fitting and completely out of the way when in an opened position.

Another counterbalanced door which has been recently developed folds up in sections and remains in a horizontal position just over the door head on the inside. This is known as the multifold type, is very easy to operate, and also quite out of the way after being opened.

Then there is the parallel sliding door for the garage which holds two or more cars. These slide in front of each other and therefore occupy no extra space either outside or within the garage itself.

Special hardware comes for all of these

various kinds of doors according to their requirements.

There is no excuse for any door not operating easily in the face of these devices. And when getting out of the car to open doors after a long trip becomes too much of a nuisance, there is the device which may be installed under the roadway, so that, as the car wheel passes over a small plate set in the driveway, the doors are automatically opened.

The same result can be obtained by a pulley arrangement attached to a post. With a simple pull of the chain, which is reached from the driver's seat, the doors are opened and latched in position. This arrangement can be applied as easily to old doors as to new ones. It may be operated either from the post mentioned, which should be approximately ten feet from the front of the garage, or from a chain placed just outside the garage near the left door.

When a more artistic appearance is wanted than the arrangement just mentioned presents, it can be made up in wrought iron and works just as well. This has been done by extending a twisted rod out from the building, which has been properly braced, and then run-

ning a slender iron chain out to the end of the rod. An iron ball or handle of some kind is attached to the end of the chain.

The electric door operator described in Chapter IX opens or closes the doors when contact is established by means of a key switch or push buttons. The former may be located on a post in the driveway and the latter wherever convenience dictates.

The matter of the hardware chosen is closely associated with the kind of door to be used, so one depends upon the other. Each kind demands a different installation, but there are certain tests every door should meet. They should be:

1. Weathertight.
2. Easy to handle.
3. Quickly opened.
4. Properly fitted.
5. Strong.
6. Attractive.
7. Fitted with durable hardware.
8. Practicable in bad weather.

To operate entrance doors that possess these points should be a continuing pleasure.

In addition to the entrance doors, hardware is also needed for the windows; and there will be locks and hinges required for cupboards, closets, or other doors to the building.

ACCESSORIES

For the home owner who delights in rigging and overhauling the engine of his own car some provision must necessarily be made for the use of block-and-tackle equipment with which to handle the engine when detached from the chassis. This may or may not require some special strengthening in the rafters of the garage roof before fastening the block and tackle thereto. Such provision is not included in the average garage, however.

With a private gasoline tank, a saving results only where large quantities of gasoline are consumed. An underground tank may be installed outside the garage, which can be piped to a pump inside. Gasoline can then be obtained at wholesale prices.

In earlier garages, too, a swinging-arm hose attachment was included as an aid in washing the car. This can be used to advantage to-day,

as it keeps the hose out of the way and eliminates the nuisance of dragging and lifting it around. The usual Boston nozzle is not as good for washing the car as a more diffused spray when working inside.

The danger attendant upon working in a closed garage with the car engine turned on cannot be dwelt upon too much, for it is human nature to think that such admonitions apply to others and not to ourselves. In order to insure safety, even if windows and doors are open, it is a good plan to provide an outlet for fumes and poisonous gases. A short length of pipe through the wall of the garage, connected by a length of rubber hose to the car's exhaust pipe, will take care of this safely. Another safeguard which has the advantage of being entirely automatic is to have sufficient air vents in the walls themselves to permit the fumes passing out.

Every man will appreciate the presence of a work bench in the garage, even if he has a more complete one in his cellar. It may be used when patching tubes and doing small repair jobs. A skeleton work bench can be set

up easily by using two pieces of 2" x 12" lumber 6' long, nailed together with cross pieces on the under side and supported by a framework of 2" x 4"s. It may be useful to have a small iron vise attached, and a rack for small tools at the back. Shelves arranged underneath will also prove useful for the paraphernalia that accumulates around a car.

Another accessory which may be included in the original plans is a work pit in the floor, which is a great convenience to the man who works under his car. This is an oblong excavation with concrete sides located directly in the middle of a car space. A detailed description of the construction will be found in Chapter VII.

A self-closing can in which to put oil-soaked rags is a good fire preventive. A fire extinguisher on hand may prove convenient also. And a drip pan to catch the oil and grease under the car keeps the floor clean and is far easier to care for than the floor itself.

A trouble light is another valuable accessory where there is an electric outlet available. It should have a minimum length of 20' of wire, and the bulb at the end should be pro-

vided with a guard, all of which can be secured at a very nominal cost.

Other accessories there are. Everyone has his pet tools and his individual preferences. Out of the following résumé, at least the first six suggestions are almost essentials and hence deserving of general acceptance:

1. Work bench, with rack for tools and shelves or drawer space.
2. Hose connection.
3. Attachment for escaping gases.
4. Closet and shelves.
5. Waste can.
6. Drip pan.
7. Fire extinguisher.
8. Floor pit.
9. Wash basin and lavatory.
10. Trouble lamp.
11. Block-and-tackle arrangement.
12. Gasoline and oil storage facilities.

So, we see that, in addition to four walls and a roof, there are many possibilities for adding to the convenience of the house that shelters our car. The surface of these possi-

bilities has been barely scratched. Within a generation our kitchens have been revolutionized. After another generation and the development of a host of new mechanical devices, who can say what the private garage may resemble twenty years hence?

IX

HEATING, LIGHTING, PLUMBING

IF THE detached garage is ever to emerge from its chrysalis state and become more than a mere shell, it should be provided with equipment that will afford heat, light, and running water when needed—conveniences that we could not be without in the house. Any one or all of these furnish good and sufficient reasons for placing the garage more adjacent to the house. And where the garage is in the house itself, this whole problem is greatly simplified.

This is an age when conveniences become necessities and, no matter what the type of garage, all three of these items are deserving of consideration when the garage is to serve in its most useful capacity.

HEATING

In colder climates, the heating of the detached garage has always been somewhat of a problem. The degree of heat maintained does not have to be such as we require in our houses, however, as the car is not quite so exacting on this point of comfort. But it does register a vigorous protest in the form of a burst radiator or cracked water jacket on some night when the temperature takes a sudden dip to unexpected levels. The cost of such experiences plus the nuisance and the wear and tear on one's disposition certainly amount to more in the long run than would the expense of a proper heating installation.

Unless one desires heat in the garage sufficient to enable his working around it in comfort during the winter, facilities for maintaining a temperature of 50 degrees are entirely adequate. Such a temperature does not preclude starting the car fairly easily, nor does it give us a bad start for the day as is the case when repeated use of the starter is necessary to warm up the car to the point where it finally decides to go.

In choosing the type of heating system, the main considerations are:

1. Economy of operation.
2. Safety.
3. Low cost of installation.

Sufficient radiation must be provided to maintain the temperature desired at the minimum cost.

Where the garage is not located much more than fifty feet from the house, it is feasible to have it connected up with the house-heating plant by a properly insulated pipe run about 3' underground. In addition to the regular asbestos insulation on this pipe, it should be placed in a conduit. The hot-water heating system—as well as steam—is quite adaptable to this purpose. Hot water probably gives the best results, as it holds heat longer and the radiator and pipes do not cool off so readily.

Where it is practicable, heating the garage from the house plant is by far the most desirable arrangement. It requires little or no attention and the additional maintenance cost

is small. A small radiator located at a convenient point will do the job in most cases.

There are several types of separate heating units that can be used in garages. A coal heater is economical to run and requires but little attention. The handling of coal and ashes, however, is always bothersome. Also, like all coal fires, it occasionally goes out and has to be rebuilt. This is most likely to occur on an extremely frosty morning when the head of the house is rushed to get away.

Another system that is fairly inexpensive to operate is the individual gas heater which is connected to a steam radiator. This arrangement is clean, but somewhat more dangerous than the coal. The installation is also more expensive as it necessitates being connected up with a gas line. The heater should be operated by a thermostat and pilot light to provide for continuous heat through the night; though a well-built garage will probably hold much of its heat for several hours.

A fourth possible source of heat is the electric stove. While it is convenient and quite safe, its frequent use soon causes a very noticeable bulging in the monthly electric bill.

The development of a unit heater burning oil also makes possible the use of still another kind of fuel. For the most part it is advisable to locate the heater in the garage where it will be near the car's radiator.

In every case where the garage is to be equipped with a separate heating unit (except where the heater is electric), the unit should be enclosed in a separate compartment or another room. A corner of the garage may be partitioned off for this purpose, preferably with hollow tile or some fireproof material. The door into this enclosure for the heater should be fireproof and have a sill raised a foot above the floor.

A heater fire in a garage has to be handled with care and furnishes another reason for having the interior walls cemented.

Where the garage is attached, of course its heating imposes but small additional burden on the system installed for the dwelling itself. In this case, it is advisable to have the radiator placed near the ceiling, where it will safely be out of the way.

A garage-heating installation in northern climates is desirable from every standpoint.

When one considers the added comfort and the saving it is to the car, the extra cost is thoroughly justified.

LIGHTING

Though it can be done at a relatively small cost, the illumination of a garage has somehow never been deemed of very considerable importance—at least judging by the comparatively few garages that have lighting arrangements. One spends but little time in his garage after dark; but a little light when coming in some dark night is sometimes not at all unwelcome.

A supply line can be run from the panel board in the house either overhead or, preferably, underground. If a trench has to be dug connecting the house and garage for some other purpose, it is a simple matter merely to lay another pipe through which electric wires can be run. Overhead wires never add to the appearance of one's property. The wiring in the garage circuit should all be in "BX" conduits. A switch box with fuses should be provided inside the garage.

Outlets in the garage will have to be arranged to suit individual requirements. A light

directly in the center overhead is not of much value when the car is in the garage. Hence, an outlet should be arranged at either or both ends on the inside, hung from the ceiling or attached to the wall. At least one of these outlets should be provided with a double plug for the use of a service lamp. An outside light at the main entrance is always very desirable.

If the garage has a service entrance, there should be a switch both here and at the main doorway. Arranging for a switch in the house from which garage lights can be regulated is a good plan and entails little extra work if done at the time of the other wiring.

If much electricity is to be consumed in the garage for power purposes, such as grinding or running machinery, the supply line should be connected with a power meter in the basement of the house. This is permissible and eventually results in a great saving.

One other way in which electricity may be utilized is for operating the main entrance doors. This is a type of equipment that, at this stage of development, still belongs in the luxury class for most home owners. The control of electrically operated doors is usually by a

set of three push buttons placed in the house, in the garage, or on a post in the driveway. One button opens the doors, a second closes them, and the third stops the doors in any desired position. By another method, the movement of the doors may be controlled through a lock device placed on a post alongside the driveway. As the driver reaches the post, he merely operates the switch by inserting a key in the lock. A third system opens the doors automatically when the car is driven over a square plate which is set in the driveway.

PLUMBING

A garage does not require plumbing in the sense that a house does, but certainly running water is necessary to complete the list of conveniences that should be a part of the equipment of the well-planned garage. Here, again, underground piping is necessary to connect with the water main inside the dwelling. Any pipes supplying water should be equipped at proper points with valves for shutting off the supply and with drain plugs to let the water out of the pipes when necessary. A pipe for returning waste to the sewer is advisable

but not essential, unless there is a lavatory in the garage.

Plumbing facilities in the garage should include at least a basin and a water connection to which a hose may be attached. To these may be added a lavatory, which is especially convenient where there are children about. Where a sewer connection becomes necessary, the drain in the garage floor may be connected to the waste pipe, avoiding the necessity of a dry well.

If the garage is to include a unit heater, together with a wash basin and water closet, additional space is of course necessary and must be provided for when laying out the garage originally. Any installations mentioned in this chapter, in fact, become more expensive when added to the garage already built.

The small additional cost of adding these conveniences to the specifications of a dwelling no doubt accounts in some measure for the trend to the attached type of garage. But, whatever the type of garage, ways and means can be found to make it completely useful, and at small cost, if one is really desirous of making it so.

X

THE APARTMENT GARAGE

THE outstanding feature about the apartment garage is that the auto space is of first importance and living quarters become merely a secondary adjunct to its main purpose. It is not a forerunner, by any means, of a time when the best part of our dwellings is to be subordinated to demands of a highly mechanical age, but it does have its place. At times this type of building serves merely as an expedient to fulfill certain immediate needs; and at others it assumes the place of an especially planned feature of a home scheme.

In certain sections of the country, the apartment garage has found a distinct usefulness. By this we do not refer primarily to the costly structure, to be found on an estate, having servants' quarters overhead; but to the garage built with an apartment above it by the man, with an average income, for his own use.

This style structure has grown to be common in some localities largely as a matter of expediency; especially in the warmer climates has it found a valuable use. There are many families who have been able to acquire an attractive plot, but who have to wait a few years before they can build on it the house of their dreams. What more sensible plan than that they should build the garage first just where they want it with an apartment in the second story? This will not only provide accommodations in the interim until their dream house materializes. It will also reduce their living costs for the time being and produce an income later when they can perhaps rent it.

The apartment garage will more than double the cost of the two-car garage by itself, but the uses to which it can be put are various. In addition to being a possible revenue producer, it may be nicely furnished and serve as guests' quarters; it may help in a pinch when some family of relatives requires temporary living quarters; or it can always be used as servants' quarters. Sometimes the family goes away and the house is rented, which makes the garage apartment a welcome

retreat for the head of the house when he has to stick to business.

A room and bath overhead also can always be conveniently converted to a large comfortable workroom with the bath a convenient place in which to clean up. Another possibility is use as a play headquarters where boys can play to their hearts' content without fear of damaging anything.

As the size of the family grows or the size of the income is expanded, extra space always becomes highly desirable. And one is never regretful of the rooms finished up for living quarters over the garage. Of course here, too, the extra money invested can be a variable amount, depending on the size and elaborateness of the apartment.

This type of building becomes especially feasible now that two-car garages have become more common. A space 20' x 20' is just large enough for two cars. A larger space, if possible, will add much to the comfort of the quarters overhead, as every square foot will count.

The planning of the first floor layout is the same as that of any two-car garage with the

exception that center posts, stairs, and a method of heating must be provided. The stairs to the upper floor may be located inside, or a staircase entrance may be constructed on the outside. On an inexpensive type of building, the latter method usually looks very awkward.

We suggest using the wider side for the front, then partitioning off one side of the garage floor for a small vestibule and enclosed stairway. Space being precious, a workroom or large closet can be built in at the back under the stairs. This gives a certain amount of privacy to the entrance and makes a better-looking building from the outside. Possibly, having the stairs outside the buildings, tenement fashion, has been the thing that has prejudiced some people against this type of building. Insurance laws of the locality should always be consulted to learn the necessary regulations when living and garage quarters are combined in this type of building.

There can also be a door from the garage proper to the stairs, so that the outside private door may lead to both the garage and the apartment. Since garages have begun to come

into their own, architecturally speaking, there is no reason why the apartment garage cannot also be made into a really attractive small home.

Of course, where these structures are found in warm climates, the heating problem is very much minimized; otherwise, some form of heating plant must be installed. Every garage should have some arrangement for heat, whether there is an apartment in conjunction or not. In the early days of the car, it was "put up" during the coldest months in a public garage, and thus the family derived no use from it at all during a part of the year when it might be of most service.

There is no doubt about the need for plumbing in the apartment garage. A completely equipped bathroom, having a wash basin, water closet, and bathtub, is necessary. In the kitchen, running water is also needed, together with a sink. And the range must be supplied with gas. The gas range and various plumbing facilities are what run up the expense on a building of this kind. But they can be made to pay dividends where circumstances warrant such an initial investment.

The apartment, of course, will also have to be completely wired for whatever electric fixtures and outlets are wanted. The more outlets provided, the better, inasmuch as in a small living space they are always wanted for a variety of purposes.

Such an apartment will of necessity be small, so there will be ample opportunity for the exercise of ingenuity in planning its layout. The most that can properly be included will be a living room (which will also be the bedroom), a kitchen, bathroom, and possibly a small dressing room or dining alcove. The entrance into the apartment should best be arranged to open into the living room.

It is under such conditions that some of the clever space-saving devices on the market can be put to good use. The folding bed here comes in very handy and in a few seconds can convert what was a living room into complete sleeping quarters. There can also be built-in bookcases and a built-in desk. In the kitchen, one corner can be utilized for a breakfast nook with either a stationary table or one that folds away against the wall. A dressing room can probably be arranged around at the back or

to one side of the wall bed. It is a great convenience, and some space must be provided for the care of clothes. It may also provide enough space to take care of a second folding bed. The right planning of wall and cupboard space in the kitchen will also make use of various wall devices here.

These features can all be made comfortable, serviceable, and attractive. And they not only save space but a great deal of time. If it seems preferable, a dining alcove, which can be closed off, can be placed at one end of the living room and a second folding bed can be arranged there rather than in the dressing room. Under any conditions, an apartment of this kind allows for plenty of light and fresh air and can be made very cheerful at the same time it is providing economical living quarters.

Structurally, the demands of the apartment garage are such that considerably more skill will be required in its erection than for a garage alone. Four 6" x 6" center posts will be necessary on the ground floor, set from the middle of the front to the middle of the rear end. These will support 6" x 6" pine

beams, on which in turn the 2" x 8" floor joists will rest. There should be a sub-floor and a finish floor laid. Ceiling joists should be 2" x 6".

The walls, when finished, will be 6" through, and the partitions 5". The interior of the second floor may be treated in several ways, but will require skilled labor to be rightly finished up. Before one is through, such a building might easily cost two or even three times what a straight two-car garage would cost.

One should not think for an instant that because the apartment garages he has seen or heard of have been unattractive, this is necessarily their salient feature. There is no more need for ugliness here than in any other type of dwelling. In fact, among those who have once lived in one there is frequently much enthusiasm expressed for their merits. If this type of structure would meet your problem, it should be chosen, as it exists to fill just that need.

XI

THE DRIVEWAY

A DISCUSSION of housing accommodations for the home auto would be hardly complete were we to neglect driveways. Unless the garage faces directly upon an alley or street, a proper method of approach must be provided. And, no matter how well-planned or completely equipped our garage may be, its full enjoyment will not be realized if the driveway is not in keeping.

Where the garage of the small home is commonly given little attention, the driveway invariably receives less. Yet it frequently occupies a relatively large amount of space on the small plot. It rarely, if ever, contributes to the beauty of the home surroundings so, as a purely utilitarian necessity, it should be kept within bounds. Yet how many homes are built with scarcely a thought given to the suppression of this important feature of the plot's layout!

In laying out driveway space, one should consider especially:

1. Appearance—saving ground space.
2. Convenience.
3. Drainage.
4. Kind of driveway.

Appearance should be given primary thought, as the less obtrusive the approach to your garage, the more successful it will be. On first glance at a driveway, the eye naturally follows it along to the garage. If rightly planned, the end of the view will not be disappointing; rather it can be made an attractive climax.

It is quite common practice for the driveway to be also the main entrance into a place. A walk may lead off from it to the front door of the house, or this entrance may open directly onto the driveway. Unifying the motor and the foot entrances can be done also when carefully planned. This is often practical and saves cutting up the front of the plot unnecessarily.

One of the worst crimes in the cause of the

private driveway is committed when it has to conform to the requirements of a garage located on the cellar level of a house that rests on a level plot. With the usual-size small plot, the very obvious result is a large hole cut into the limited area of the front yard. Then, when the sides of this opening have been lined with concrete and a driveway laid of the same material, the size of the hole is still further magnified to the eye. The result is an ungainly gaping hole that occupies the center of attention at the front of the house and that creates a danger spot for the children playing about.

It is also a mistake to run a driveway the full length of a plot if it can be possibly avoided. Valuable space is usurped that might better be devoted to extending the garden area. And what looks still worse is to have a long driveway that has been entirely concreted. In time, it becomes streaked with grease and looks unsightly. Ground area is often wasted, too, in providing turning space where the garage entrance is in the rear of the house or in some other inconvenient location.

Where the ground space makes it feasible,

doors can be put in both ends of the garage, so that one may drive in at one end and out at the opposite end.

The best guide after all must be one's own common sense in adapting his arrangements to his own wants. No set of rules can define these. All home plots are, or should be, the expression of the owner's individuality. They can all be different at the same time that they follow general lines of good practice that should be common to all.

The good driveway not only has to be passable in appearance, but must be conveniently accessible to both garage and house. Where the garage is detached, it is a good plan for the driveway to pass as near to an entrance of the house as possible. And the approach into the garage should be made easy, especially since the lady of the house occupies the driver's seat so much of the time now. Most home owners use their garages at least once a day. And there is usually little excuse for having an awkward entrance that requires special maneuvering and patience every time one drives through. The right arrangement in the first place can make getting in and out of a

garage a pleasure instead of an occasion to be repeatedly dreaded.

The third important point is drainage. In laying a concrete driveway, it should set well in the ground to preclude the soil being washed out from underneath at any point; and, at the same time, it should rise slightly above the level of the ground. A solid concrete driveway can be made high in the center so as to drain off the water at the sides, or it can have a low center and serve as a runway for the water.

Where the driveway is excavated and forms a ramp leading into the garage, the problem of drainage may become acute. In this case there should be a drain entirely across the entrance to the garage set about one inch lower than the floor. An iron grating over hollow tile or a concrete trough to carry off the water will serve. This may go to a dry well or connect with the drain in the center of the garage floor. This is an important provision if flooded floors are to be avoided. In fact, any garage floor that sets below the level of the ground must be protected in some such way.

Where parallel concrete strips compose the driveway, the best form is to have the two outer edges raised 2" above the surface of the strip itself to form a low curbing. It is especially important with strips of concrete to have them so protected that they will not be readily washed out. When weakened at any point in the base, they quickly become cracked and then go on from bad to worse. Replacement is expensive.

Driveways may be of several kinds, but concrete seems to have achieved popular favor as being the best material for auto driveways. Other good materials are cinders, and gravel or crushed stone. Bluestone crushed fairly fine and worked well into the ground makes a good driveway and looks much better than cinders. Where these loose materials are used, a small concrete curbing, or wooden edging, should be put in along the sides. The surface should be spread generously to a thickness of from 3" to 4" as the stones gradually become worked down into the soil.

A solid concrete driveway is no doubt durable, but it is undesirable unless one does not object to running a continuation of the street

pavement through his property. Two concrete strips look much better and cost considerably less. Either crushed rock, or preferably lawn, may occupy the intervening space between the strips. Concrete is easy to take care of and seldom requires repairs, though it costs more than the other types. Stone and cinder driveways require renewing every few years and need more attention.

At the minimum, the driveway should not be narrower than 7'. The concrete-pavement type of driveway should preferably have a width between 8' and 10'. Where it enters the garage, there should be a concrete apron of generous width sloping outward. The apron at the street curb should also be wider. Concrete strips should measure 56" from center to center and not be narrower than 16". This width may vary anywhere from 16" to 24". Lawn space intervening looks very well and relieves the glaring appearance of the concrete surface. Both types of concrete driveways should be provided with curbs at the outer edges. These sometimes help to keep the auto wheels from cutting up the lawn.

The first requirement of a good concrete

driveway is a carefully prepared base, especially where there are to be strips. Where the weight of an automobile is continually passing over the surface, any soft spots are bound to be found out and will result in breaking the concrete.

Where the driveway is to be entirely of concrete, 5" will be allowance enough for thickness. The center may be raised another inch to give it a "crown" and thus insure good drainage. Concrete strips should be not less than 6" thick throughout. When excavating, enough soil should be removed to allow for a 4" sub-base of gravel or cinders. This should be well tamped down at every point and may be leveled off with a wood gauge. Getting the grade as level as possible for the full length is important.

The forms should be staked at 4' intervals to secure uniform results. It is possible to build a form in such a way as to give the shape for the curbing at the sides, but a simpler way in which to get this curb is by the use of the specially shaped template shown in Figure 20. The outside form should be built up 2" higher than the one on the inside. If the

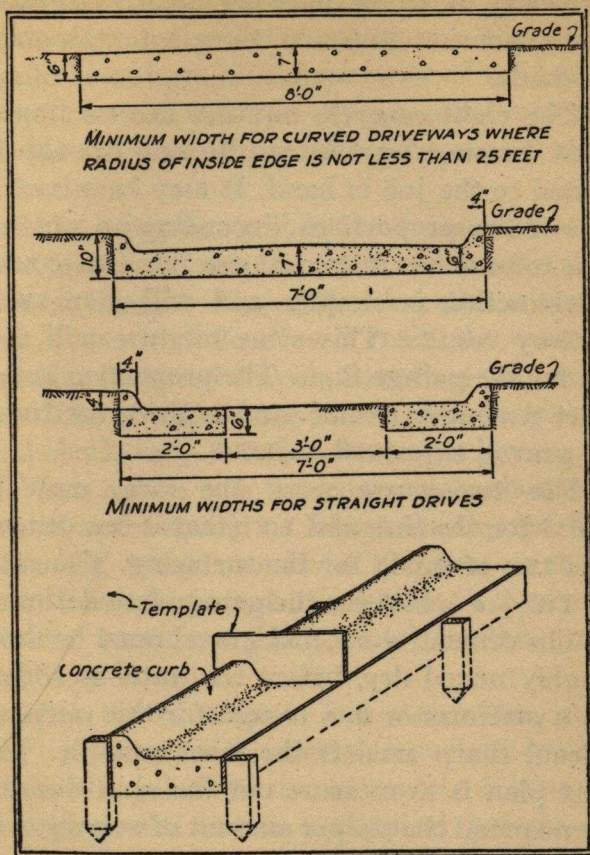


FIGURE 20. Concrete driveway construction. (Portland Cement Association.)

driveway is to be over 20' long, allowance for expansion joints at these intervals must be made.

The right concrete mixture has an important bearing on the results and should be suited to the job in hand. It may be mixed in one of two proportions, depending on whether it is to be a one- or two-course job. One-course construction is simpler and will give satisfactory results. This same mixture will also do for the garage floor. The proportion is one part cement to two of sand to three (or four) of gravel, expressed as 1:2:3.

For two-course work the ratio may be 1:3:5 for the base and 1:2 (that is one cement and two of sand) for the surfacing. The ratio of 1:2½:5 is best for the garage foundation.

The cement, sand, and gravel must be thoroughly mixed dry, before the water is added, on a platform or in a trough for this purpose. Clean, sharp sand is the most suitable. The best plan is to measure out the sand desired, then spread the proper amount of cement over it, and turn over the two until well mixed. The necessary amount of gravel is next mixed in and water is gradually added until the whole

mass has been very thoroughly mixed and has attained a jelly-like consistency. The aim should be to have all the particles of sand and gravel covered with the wet cement. Portland cement is best and should be thoroughly dry when used.

After being dumped in the forms, the concrete is spread out carefully and leveled off with a straight edge. Working the surface with a wooden "float" will force the coarser material back and leave a smooth, sandy surface. The straight edge can be used to give a final check as to whether the top is level.

When it is to be a two-course job, about an inch of space should be left at the top for the surfacing, which should be in place as soon after the base is laid as possible. To secure rounded corners, a finish trowel for this purpose is used.

After the concrete is laid comes the "setting" process which is very important to the life of the job. This is not merely a process of drying out, but is a chemical process of hydration which properly requires several days. This process can be furthered if the new concrete surface is covered with straw or sand

and kept wet for several days. Cars should not be run over the new concrete driveway for at least two weeks and preferably longer. Removing the forms after three weeks should be safe.

The most common defects in cement work come from not working with clean materials, carelessness in their mixing, or from having the wrong proportions. Allowing the concrete to dry out too quickly sometimes is the cause of premature cracking or "crumbling."

The cement work appertaining to the garage structure—and nearly every one of good construction has some—is a very important element in its success. A poor garage floor or a cracking foundation is costly and quite unnecessary. Hence the value of giving study to even the bare principles of properly handling this part of the work. First-class results are obtainable if good materials are used and if effort is rightly directed in the first instance; and in the long run they become less expensive.

It is a continuing pleasure to drive in and out of the premises, the garage and driveway of which have been planned correctly. And

this means both for convenience and for appearance. The driveway feature need not be a great detraction from the appearance of house grounds if individual home owners would give the matter thought so that their driveway will not appear shoddy and dominate their landscaping plan, but rather will be neat and not conspicuous, assuming only its rightful place in the home scheme.

XII

THE CORRECT GARAGE

THE place we call home is a place of permanence. It is a place of many daily contacts and experiences. It is the place wherein we live and our children spend their impressionable years. And our children, grown up, carry with them lasting impressions and habits derived from that environment which has become so familiar through the early years. So, how well expended is the effort that shows care and thought on the part of the owners in every feature of this environment, and thus causes them to be proud it is theirs!

The garage feature of our modern home environment has attained the point of permanency. Hence its importance. Its contribution to the home atmosphere is surely worthy of more consideration than the neglect or indifference that appears to be the attitude of so many home owners. The garage should be

characterized by the same attention given to the landscaping or even to the interior arrangement of the house itself. And what house is there now which does not have a garage in conjunction with it?

If your garage satisfactorily meets the test of the seven questions outlined at the end of the first chapter, it is probably worth taking a long trip to see. Yet there is no one of these that can properly be ignored or that is actually unreasonable. By here summarizing the answers to these various questions, we should not be far from having the specifications for a correct garage. Allowance must naturally be made for individual requirements when adapting these to your own use:

1. Does your garage harmonize with its surroundings?

The garage must be architecturally at one with the house, both in design and in materials of construction.

The planting arrangement of the house should be extended to take in the garage. Particular pains should be taken not to have obtrusive doors in the main entrance.

A good attached garage is so planned that its lines entirely harmonize with the rest of the dwelling; it constitutes but a detail to which special attention should not be drawn by reason of its awkward placement. The door may be placed on any side that convenience and the design of the house may dictate.

2. Has it the proper location and driveway arrangement?

A good location conserves the need for driveway space, and does not unnecessarily cut up the plot.

Frequent usage makes accessibility for driving in and out highly desirable.

Driveway should be drained correctly and be made of durable material.

The driveway should not be narrower than 7'; the minimum width for cement strips is 16".

3. Is it economical?

The home-owner who gets a good garage of durable construction for the lowest possible cost gets an economical, though not a cheap, building.

This means its being planned right in the

first instance to avoid subsequent changes and unnecessary repair charges.

4. Is it the right size and conveniently arranged?

The recommended minimum inside measurements for a single garage are a length of 18' and a width of 10'; for a double garage 20' x 20' will provide ample space. There should be ample allowance for room inside to work on the car and for extra needs such as workroom space, storage of garden tools, etc.

Doors and windows will be placed so as to afford the greatest amount of light and convenience in operating.

5. Is it well constructed?

Foundation walls should be a minimum of 8" wide at the top with a wider footing at the base set well below the frost line, and provided with anchor bolts. The concrete mixture is in ratio of one part cement to three of sand and five of gravel.

Lumber for framing and sheathing should be No. 2 common grade; that for trim and finish work, doors, and windows should all be first grade.

White Pine is very good lumber for siding and trim; while California redwood and cypress are also satisfactory for outdoor work.

Studding should be set on 16" centers and doubled at the sides of door openings.

Head piece over main entrance should be either braced or composed of extra heavy timbers.

Roof rafters should be braced with tie pieces, and properly surfaced at ends.

With frame construction, sheathing with heavy building paper, or some form of insulation, should be used in covering sides.

Shingles should be pre-stained and laid 5" to the weather.

Provision should be made for a ceiling and lining the interior walls, using cement plaster or fiber board.

Stucco should be laid $\frac{3}{4}$ " thick on galvanized metal lath.

Flashings, gutters, and leaders are preferably made of 16-ounce copper.

Best main doors are those sliding inward or that go overhead. A service door as a

part of these doors or built in separately is desirable.

The floor should be of 4" concrete laid on well-tamped cinder base and sloped for drainage.

Electric wires and any piping connecting house and garage should be laid underground 6" below the frost line.

Wood exterior should be covered with three coats of lead-and-oil paint.

All lumber, paint, and other materials should preferably be standard grades of the best manufacture bearing brand labels known to be reliable.

Fireproof requirements for garages built in dwellings are best summarized in the following regulations made up by the Building Code Committee of the Department of Commerce:

SECTION 43. PRIVATE GARAGES COMBINED WITH DWELLINGS

When a garage is located beneath or attached to a dwelling, the following regulations as to its construction shall be rigidly observed:

1. The floor and ceiling construction above the garage when it is located beneath the building, or the

roof when the garage is attached to the building, shall be unpierced and shall have a fire resistance of one hour, based upon the standard specifications for fire tests of materials and construction.

For floors and ceilings over garages the best and most reliable construction is reinforced concrete or some other type of incombustible, fire-resistive floor complying with fire-test requirements. Roof construction should be equivalent to that indicated for overhead floor and ceiling.

2. Walls and partitions shall be of such construction as will meet the requirements of the one-hour fire test as above specified. The following are recommended: Brick, hollow tile, concrete block, or gypsum block 4" thick, or reinforced concrete 3" thick.

An inexpensive construction which has been found by test to meet the requirements for walls consists of wooden studs spaced 16" on centers, with a back-plastered Portland-cement stucco on metal lath attached to the outside of the studs and with metal lath and $\frac{3}{4}$ " Portland cement or gypsum plaster attached to the inside of the studs. For partitions, $\frac{3}{4}$ " Portland cement or gypsum plaster on metal lath on each side of stud construction as above specified may be accepted as fulfilling the requirement.

3. When a garage is located beneath a dwelling all doors and windows with their frames and sash shall be of standard fireproof construction and glazed with wired glass.

Fire doors are made in both swinging and sliding types, and many of the former are as artistic in

appearance as wooden doors. Wired-glass glazing is required in all exterior windows or doors to prevent flames from a fire in the garage breaking through and endangering windows in the stories above.

4. Openings from dwelling into garage shall be restricted to a single doorway; such opening shall be protected by a standard, swinging, self-closing fire door with approved fire-resistive frames and hardware. No glass shall be permitted in such door.

5. When a doorway connects directly with a cellar or basement on the same or lower level in which there is any heating device or gas fixture, the door sill shall be raised at least 1' above the garage floor level or the doorway shall lead into a vestibule from which a second door connects with the cellar or basement.

6. Garage floors shall be of concrete or equally fire-resistive and impervious material.

6. Does it possess the proper equipment?

In cold climates, there should be provision for keeping the garage temperature up to 50 degrees either by utilizing the house heating plant or installing a separate unit.

Work bench, shelves, and cupboard space are almost essentials.

The garage should have at least two light outlets inside and an exterior light; and

it is a convenience to have a control switch in the house. All wiring should be run in conduits.

Plumbing arrangements should make provision for a hose connection, wash basin, floor drain, and possibly a lavatory. Brass is the best metal for piping and fixtures.

Every garage should be equipped with

1. Fire extinguisher.
2. Drip pan, and
3. Automatically closing pan for receiving waste.

7. Does it adequately serve your individual needs?

While we can here point out a lot of "shoulds" and indicate what is good practice, at the best these points can only comprise general lines as a guide to good procedure.

Adjustments must be made to suit varying individual requirements and tastes. Some of the items mentioned may have no place in your scheme of a garage, whereas you may wish to carry through ideas outside the scope of this book.

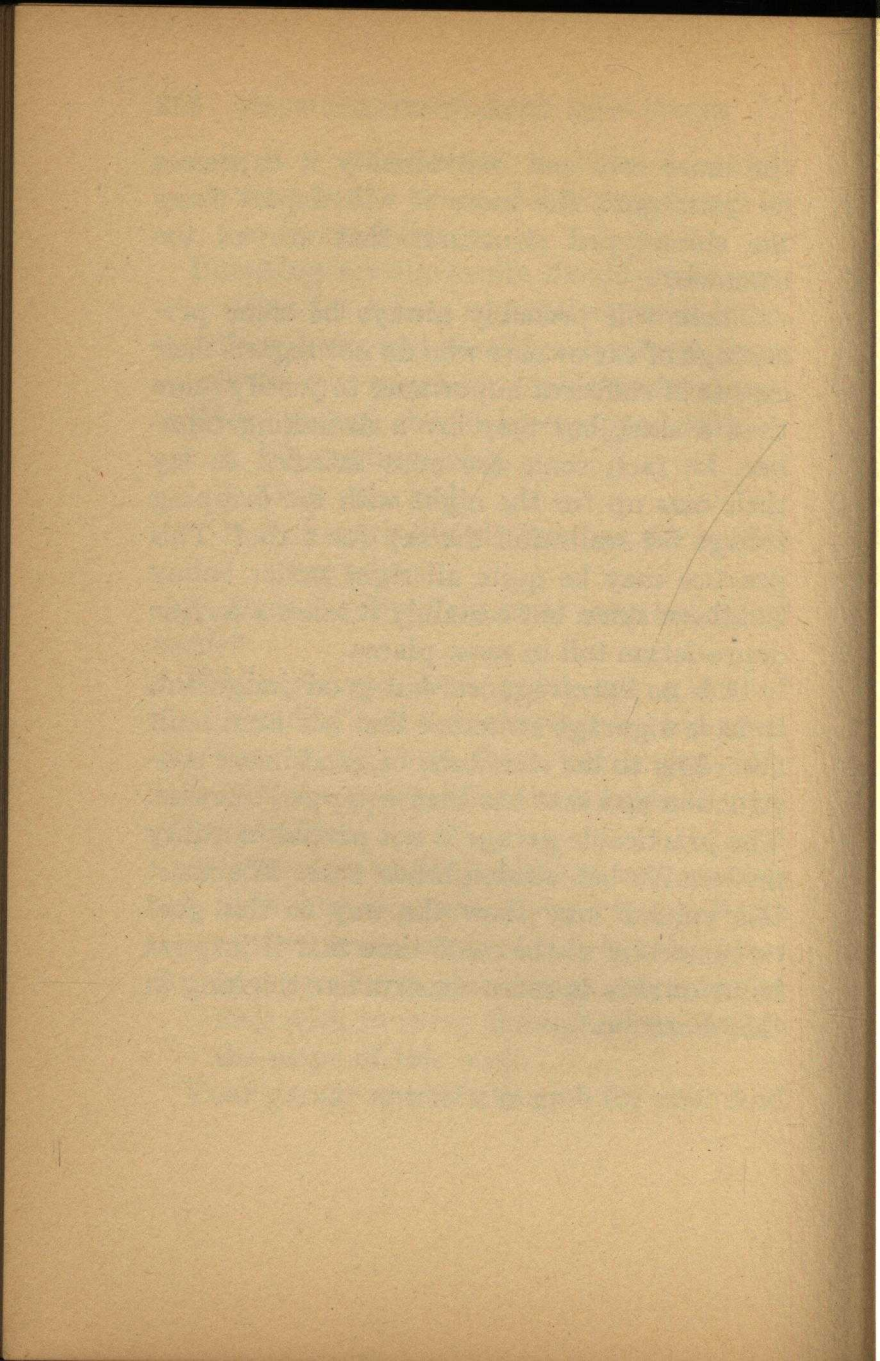
Your garage must do the job for you. And

the more care and individuality it expresses on your part, the more it will depart from the stereotyped structures that are all too common.

There will probably always be some percentage of car owners who do not regard their cars as of sufficient importance to justify more than a shed, but they are a dwindling number. In fact, some are even satisfied to lay their cars up for the night with the dripping foliage for walls and the sky for a roof. This practice may be quite all right under balmy Southern skies, but certainly it takes a terrific depreciation toll in most places.

It is no extravagance, but good judgment, to have a garage structure that has been built according to the standards of good house construction and that has been equipped likewise. The practicable garage is not partial to utility or beauty, but accomplishes both. We trust this volume may show the way to this goal economically at the same time that it inspires home owners to more constructive thinking in this direction.

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